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Entrance and Exit Ramp Terminal Design

by

© Mark Huberman

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF Master of Science

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To Michelle

ABSTRACT

Design standards for entrance and exit ramps are based upon the measured acceleration and deceleration capability performance of passenger vehicles. To date, the source most widely reffered to for design purposes is "A Policy on the Geometric Design of Rural Highways", an American Association of State Highway Officials publication. Acceleration and deceleration rates found in this publication represent findings of tests that were conducted prior to 1950. A need has been expressed to update design criteria based upon our present vehicle characteristics. In order to review design standards based on AASHO recommendations, acceleration and deceleration rates of current vehicles are required. This report involves an investigation of a technique to measure vehicle performance capabilities on ramps. Acceleration and deceleration rates obtained from this study are compared with the AASHO acceleration and deceleration curves.

This comparison indicated the insensitivity of the AASHO acceleration curve to represent modern vehicle acceleration performance capabilities at lower speed ranges. It was found that deceleration length requirements recommended by AASHO are still valid.

ACKNOWLEDGMENT

The author has received much helpful cooperation during the preparation of this study and desires to acknowledge his indebtedness.

In particular I would like to thank Professor J.J. Bakker for his innumerable suggestions during the study and for catching many small but troublesome errors. More importantly, his guidance and encouragement throughout was invaluable. I would also like to thank Professor Stan Teply who was instrumental in the initiation of the study.

I wish to acknowledge the funding and assistance provided by Alberta Transportation during the data collection phase of the study.

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1. INTRODUCTION

On the basis of various recent research studies, (4, 9, 11, 12, 15, 18, 19, 24), it is apparent that highway designers are becoming increasingly concerned with the relationship between highway design and vehicle performance characteristics. An excellent example of this is in the design of acceleration and deceleration lanes. To obtain and maintain maximum efficiency and safety in the operation of these speed - change lanes, as well as on the main facility, it is necessary to relate the designs of these ramp terminals to passenger car performance capabilities and vehicle registration trends.

Drivers leaving a highway at an exit ramp are usually required to reduce their speed. On the other hand, drivers entering a highway at an entrance ramp have to accelerate to reach the desired speed of the traffic on the through highway. Whenever this deceleration or acceleration by exiting or entering vehicular traffic takes place on the through highway it disrupts the flow of through traffic and is hazardous. To minimize these undesirable aspects on high-speed facilities, maximum use should be made of acceleration and deceleration lanes.

To insure ideal operating conditions, acceleration and deceleration lanes should be used for their entire length by vehicles entering or exiting the through highway. Each acceleration and deceleration lane, therefore, should be of

a design that would enable a driver to manoeuvre his vehicle onto it without a major change in speed and, once on it, to make the necessary change between the speed of operation on the main facility and the lower speed required for exit or entrance .

A need has been expressed to update design criteria based upon our present vehicle characteristics. Over the past few years, there has been a modification in the range of vehicles. Historically, the size and power of vehicles have ranged from light cars having low performance capabilities to heavy and high performance vehicles. A trend has now developed whereby vehicles of modest weights and powers are replacing the more powerful vehicles. As a consequence, this trend compresses the range of vehicles, resulting in a more homogeneous vehicle population.

Design standards for ramp geometrics are based upon the measured acceleration and deceleration performance of vehicles. To date, the data most widely used for design purposes is presented in the American Association of State Highway Officials (AASHO)(1), A Policy on the Geometric Design of Rural Highways, from tests conducted prior to 1950. (The American Association Of State Highway Officials have since changed their name to the American Association of State Highway and Transportation Officials, AASHTO(2)). The criteria used in these early studies are not sensitive to the changes and modifications of the current vehicle population.

1.1 OBJECTIVES

This thesis had two basic objectives. The first objective was to devise a technique of measuring vehicle acceleration and deceleration rates on interchange entrance and exit ramps. The second was to compare the findings with currently used design criteria and to assess the validity of existing design criteria.

Acceleration rates obtained from this study were compared with the AASHO and Matson(20) acceleration curves. Deceleration data was compared with the AASHO deceleration curves. These comparisons were undertaken to confirm that the survey technique generated data which were directly comparable with existing design curves and to validate the applicability or reject the ability of these curves to suitably meet current vehicle performance characteristics.

Although there are many geometric variables which influence the behaviour of vehicles on both entrance and exit ramps, i.e., angle of convergence and divergence, ramp and freeway grades, this study only addresses the acceleration and deceleration of vehicles.

1.2 THE ORGANIZATION OF THE THESIS

The thesis has been divided into three principal tasks, each of which is reported separately in the technical sections that follow.

The first principle task is documented in Chapter 2. This chapter deals with the methods of evaluation that were used in the study, those being the survey of entrance and exit ramp vehicles ,the analysis of vehicle registration trends and the theory behind highway and ramp speeds. The vehicle survey was undertaken using a radar speedometer method to determine vehicle acceleration and deceleration capabilities.

The second task was three fold. The first portion is reported in Chapter 3. This was the compilation of the underlying principles and concepts used as the basis for ramp designs. These included, the laws of motion, acceleration rates and deceleration rates.

The second portion is reported in Chapter 4. A literature search of Canadian, American and European ramp design standards was compiled. Canadian geometric standards included in the literature review are the Roads and Transportation Association of Canada's Geometric Design Guide (RTAC)(34) and the Urban Highway Design Guide (UHDG)(33) currently being used in the Province of Alberta. Each manual, handbook or policy was reviewed thoroughly and a summary of the pertinent findings were tabulated. Standards currently being used in the Province of Alberta have been included in the survey as they have recently been re-examined and revised in the light of more recent developments and experience.

The final portion of the second task is reported in the last section of Chapter 4. The main objective was to compare and rank Canadian ramp designs with those ramp standards currently being used by other countries and highway agencies.

Chapter 5 discusses the background theory of the radar speedometer and the technical information required to use the device properly during actual field applications.

A detailed discussion of the vehicle survey technique and vehicle registration trends is reported in Chapter 6. This chapter includes the site selection procedure, field applications and the data collection portion of the study.

Chapter 7 is devoted to the third principle task and is divided up into four sections. The first section discusses highway and ramp contolling speeds. The following two sections contain the findings of the vehicle performance survey as well as the analysis of the collected data. The data was analyzed such that it could be directly compared with existing acceleration and deceleration design curves.The final section of chapter 7 attempts to relate the findings of the vehicle performance survey with currently used ramp design curves and with future vehicle registration trends.

Chapter 8 deals with a discussion and commentary on the methods of evaluation used, and on the analysis of the study findings.

The appendices include the data collected from the vehicle performance survey and the speed study history analysis.

2. METHODS OF EVALUATION

2.1 INTRODUCTION

In order to determine the adequacy of existing and future ramp terminal designs, two interrelated methods of evaluation have been developed. The first method is simply to investigate vehicle registration trends over the past few years to determine the types of vehicles currently in service and those that will be in service during the upcoming decade. Associated with the types of vehicles using the roadways are their continuously changing operating characteristics. The second method of evaluation is to determine whether existing ramp terminal standards are adequate due to these changing vehicle characteristics.

2.2 VEHICLE REGISTRATION AND PERFORMANCE TRENDS

Trends over the past decade reveal that average weights, horsepowers and engine sizes of passenger vehicles have declined during this period(13, 25, 39, 40). These changes in passenger cars are brought about through the replacement of heavy and high performance automobiles with others of more modest weights and powers, rather than through the introduction of lighter and lower performance vehicles. This leads to a more homogeneous vehicle population. Trends for the future reveal that although fuel economy will continue to improve during the next few years,

vehicle performance capabilities will remain fairly steady with little appreciable change.

2.3 VEHICLE PERFORMANCE CHARACTERISTICS

In light of the conclusions concerning trends and vehicle performance characteristics,it is of interest to determine whether existing ramp terminal design standards are adequate.

Many freeway entrance and exit ramp designs have been developed and are currently open to traffic but their efficiency has not been adequately monitored due to the lack of sufficient field data.

In spite of the knowledge gained from these early studies(3) as well as from more recent investigations(35, 41), there exists a need for research of a more comprehensive nature to update design criteria based upon the operational effects of current and future vehicle characteristics.

Consequently, this study reviews and evaluates existing geometric design standards and techniques used in the design of highway entrance and exit ramps in view of vehicle performance changes, more specifically acceleration and deceleration rates. This is accomplished by analyzing present vehicle performance characteristics to determine the requirements for acceleration and deceleration lane lengths, keeping in mind both mainline speeds and speeds on the

controlling ramp curves.A radar speedometer technique was used in this study to monitor vehicle performances on entrance and exit ramps. By using this approach, a comparison with existing design standards was developed. If it is determined that present design standards fail to meet the performance criteria as reflected by the present vehicle population, new design standards for entrance and exit ramps will be determined using present vehicle performance characteristics as the basis for development.

2.4 EVALUATION OF HIGHWAY SPEEDS AND SPEEDS ON CONTROLLING RAMP CURVES

Key issues in the design of a highway entrance or exit terminal are highway speeds and speeds on controlling ramp curves(6). The speed assumed for ramp vehicles as related to the speed of the highway traffic is used as the basis for the design of acceleration and deceleration lanes.

The two different speeds that are associated with the design of ramp terminals are design speed and running speed.

The design speed of a highway is selected for purposes of design and correlation of the geometric features of a highway. It is a measure of the quality of service offered by the highway. The design speed is the highest continuous speed at which individual vehicles can travel with safety upon a highway when weather conditions are favorable, traffic density is low and the geometric design features of

the highway are the governing conditions for safe speed.

The average running speed of a highway is the average for all traffic or a component of traffic. It is the speed over a specified length of roadway, determined by dividing the distance by the running time which does not include time for stops.

Design speeds recommended and the corresponding average running speeds for three volume ranges are illustrated in Table 2.1. The running speed for low volumes is used as the design control for the design of acceleration and deceleration lanes.

This study will review running speeds on ramps and speeds on through highways to determine if the relationships reported in Table 2.1 are consistent with the ramp terminals analyzed in this study.

Table 2.1 DESIGN SPEEDS AND CORRESPONDING RUNNING SPEEDS

HIGHWAY DESIGN SPEED (km/h)	AVERAGE RUNNING SPEED			
	AASHO (km/h)			RTAC (km/h)
	LOW VOLUME	INTER VOLUME	HIGH VOLUME	
50	45	42	40	50
60	55	48	45	60
70	63	58	52	70
80	71	66	56	80
100	83	76	60	97.5
110	93	87	-	102.8
120	103	95	-	107.4

RAMP DESIGN SPEED (km/h)	AVERAGE RUNNING SPEED	
	AASHO (km/h)	RTAC (km/h)
50	45	50
60	55	60
70	63	70
80	71	80
100	83	97.5

3. UNDERLYING PRINCIPLES OF RAMP DESIGNS

3.1 INTRODUCTION

In order to understand how ramp geometric standards have been developed, it is essential to review the underlying principles of vehicle operating characteristics(27). This chapter is devoted to the discussion of both the relationships between time, distance and velocity, i.e., the laws of motion, and vehicle acceleration and deceleration rates which are used as the basis for the majority of entrance and exit ramp design standards.

3.2 ACCELERATION

3.2.1 LAWS OF MOTION

The following equations(16) indicate the mathematical relationships that exist between time, distance, velocity and acceleration rate.

Uniform motion (constant velocity):

$$v=\frac{l}{t}$$

Uniform accelerated motion ($v_o > 0$):

$$v_f = v_o + at$$

$$l = v_o t + \tfrac{1}{2}at^2$$

$$v_f = v_o + \sqrt{2al}$$

Uniform accelerated motion ($v_o = 0$):

$$v_f = at$$

$$l = \tfrac{1}{2}at^2$$

$$v_f = \sqrt{2al}$$

Conversion of velocity from metres per second to kilometres per hour:

$$V = 0.2778v$$

Conversion of acceleration rate from metres per second per second to kilometres per hour per second:

$$A = a/3.6$$

Where:

a =acceleration rate in metres per second per second

A =acceleration rate in kilometres per hour per second

V =average speed in kilometres per hour

v =average velocity in metres per second

l =distance in metres

v =final velocity in metres per second

v =initial velocity in metres per second

t =time in seconds

3.2.2 VEHICLE ACCELERATION RATES

The vehicle acceleration rates most widely used for design purposes are documented in the American Association of State Highway Officials publication; A policy on the Geometric Design of Rural Highways(1). Both the Urban Highway Design Guide(33) and the Roads and Transportation of Canada(34) design standards have their origin based on the acceleration rates derived by American Association of State Highway Officials.

The acceleration rates of the curve in Figure 3.1 are used as the basis in determining lengths of acceleration lanes. This curve was developed from tests conducted prior to 1950 and is considered representative of normal acceleration, that is, acceleration under normal or unhurried control of the majority of drivers. The acceleration rates of the curve have been converted to the directly usable form in Figure 3.2 showing distance travelled while accelerating from one speed to another.

Matson(20) also studied acceleration rates of vehicles in 1955 and determined that the curve in Figure 3.3 was representative of normal acceleration of passenger vehicles under normal operating conditions. Matson acceleration rates have been converted to the directly usable form in Figure 3.4 showing distance travelled while accelerating from one

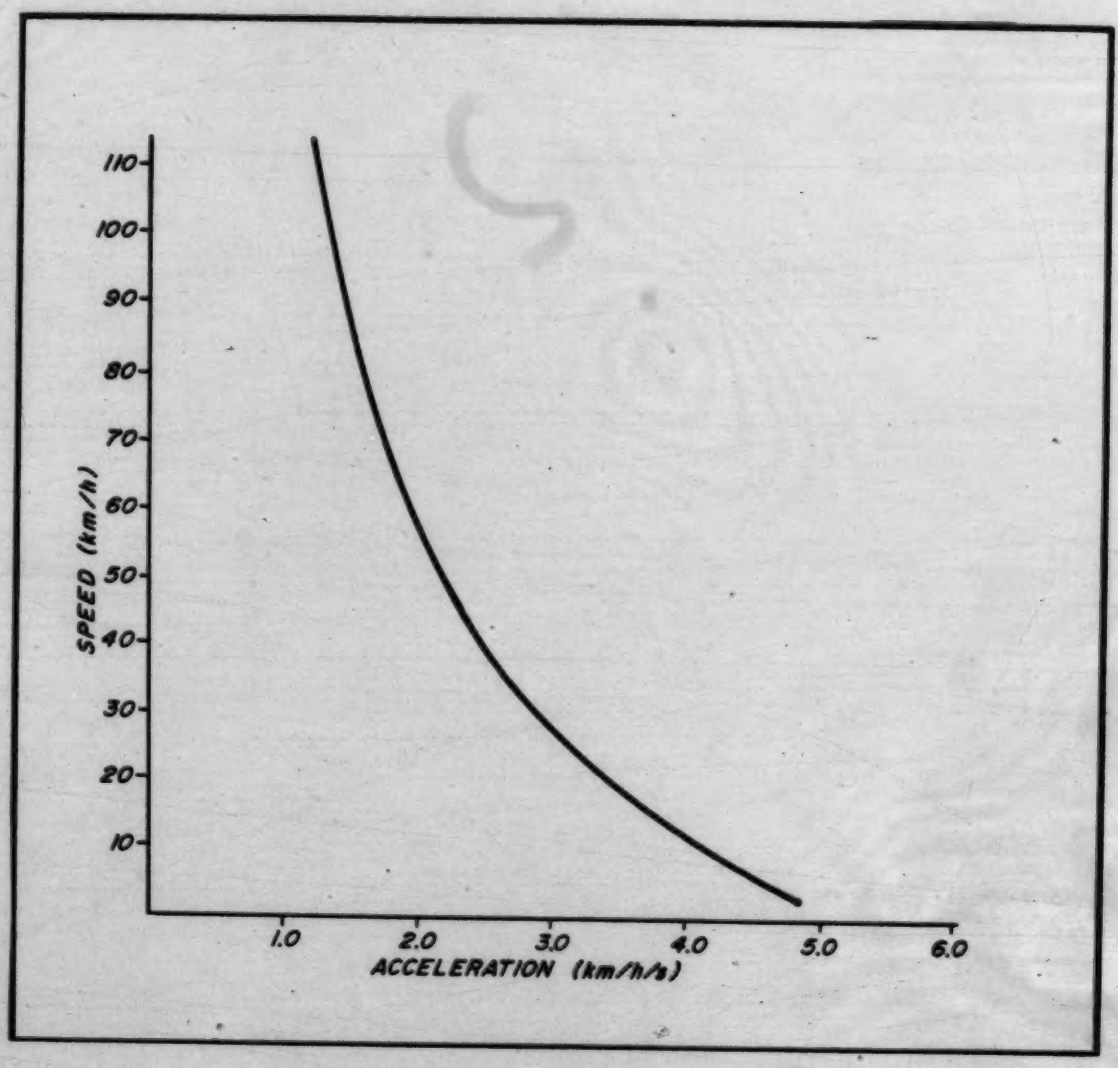


Figure 3.1 ACCELERATION RATES OF PASSENGER VEHICLES-AASHO

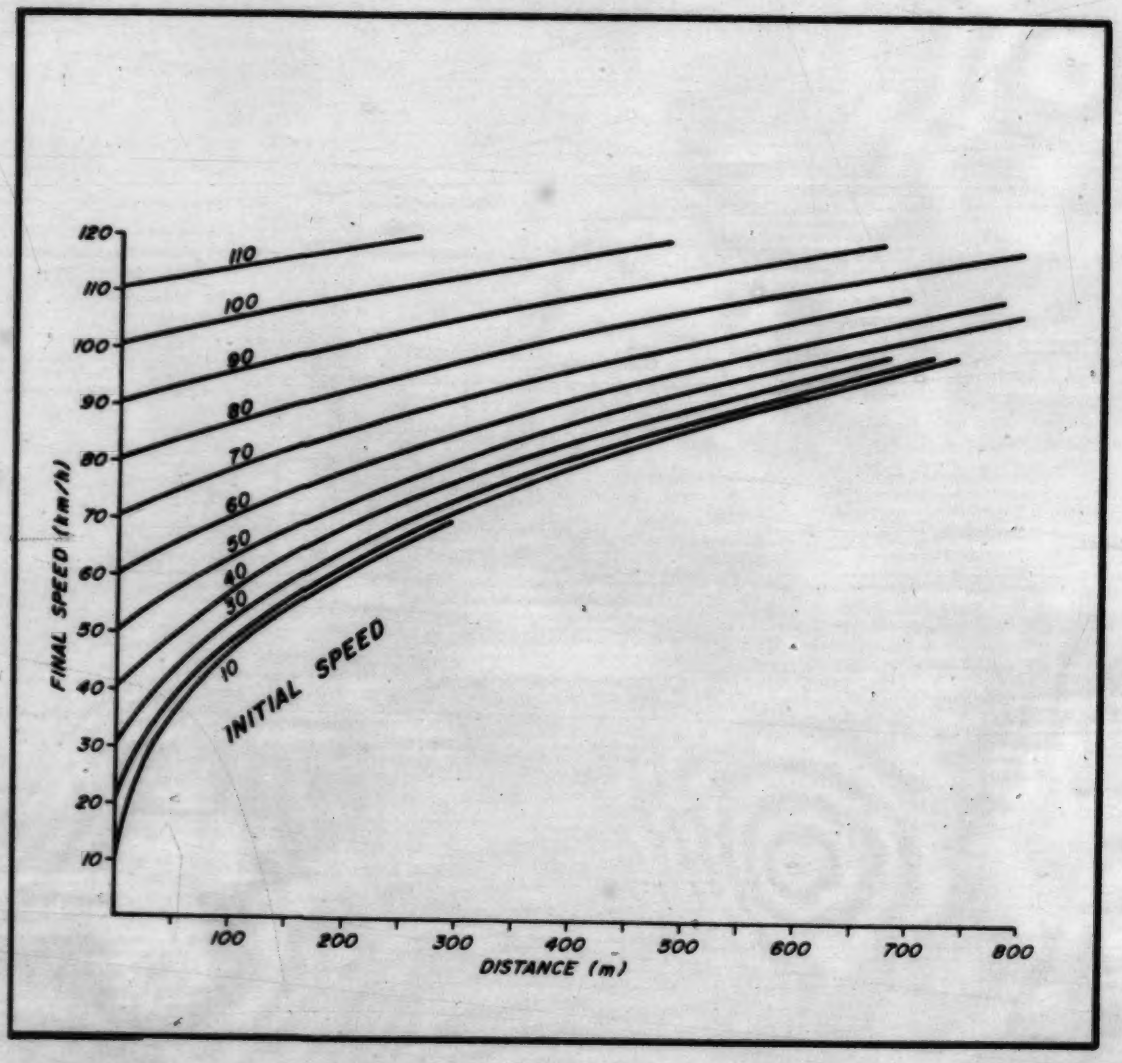


Figure 3.2 DISTANCE TRAVELLED WHILE ACCELERATING-AASHO

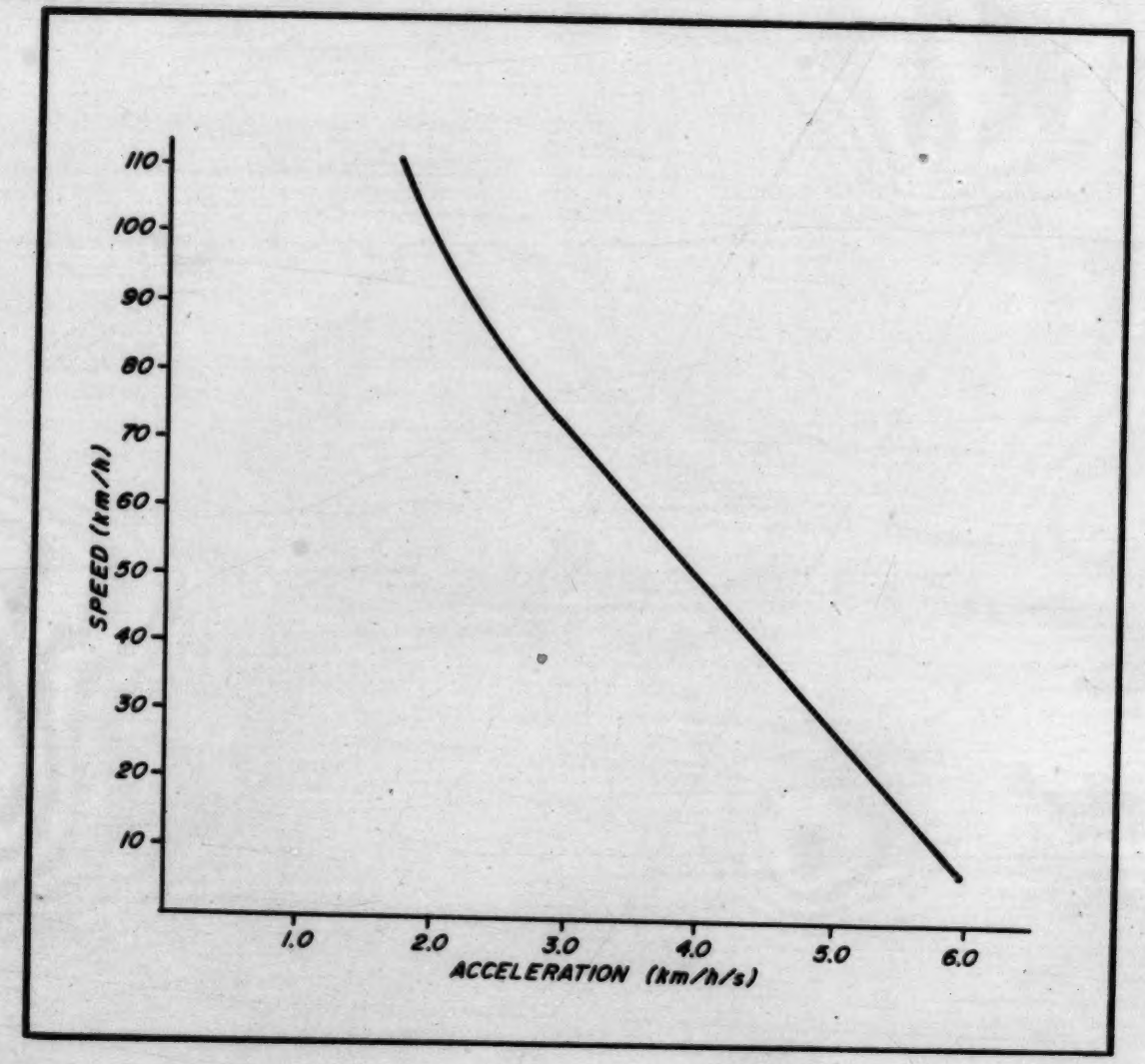


Figure 3.3 ACCELERATION RATES OF PASSENGER VEHICLES-MATSON

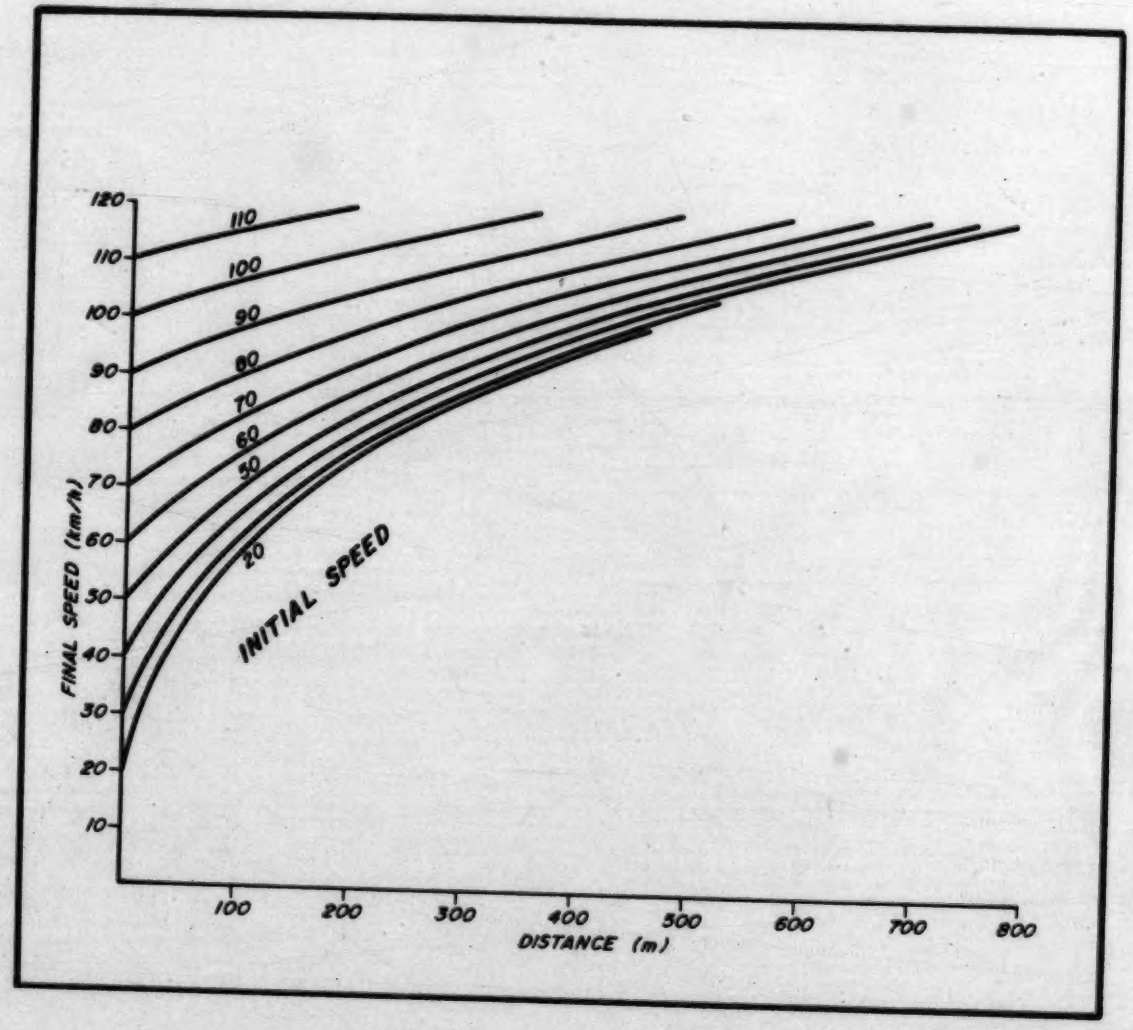


Figure 3.4 DISTANCE TRAVELLED WHILE ACCELERATING-MATSON

speed to another.

A comparison of AASHO's speed - distance curve and the Matson speed - distance curve are illustrated on Figure 3.5. This comparison reveals that if the AASHO acceleration curve were used for design purposes, a distance of 220 metres would be required to accelerate from 60 km/h to 80 km/h as opposed to 130 metres required to accelerate between the same speeds if the Matson curve was used as the basis for design.

The question arises as to whether the American Association of State Officials or the Matson acceleration curve are adequate and representative of the operating characteristics of the current vehicle population.

3.3 DECELERATION

3.3.1 LAWS OF MOTION

The following equations(16) indicate the mathematical relationships that exist between time, velocity, distance and deceleration rate:

Uniform decelerated motion ($v_f > 0$):

$$v_f = v_o - dt$$

$$l = v_o t - \tfrac{1}{2} d t^2$$

$$v_f = v_o - \sqrt{2dl}$$

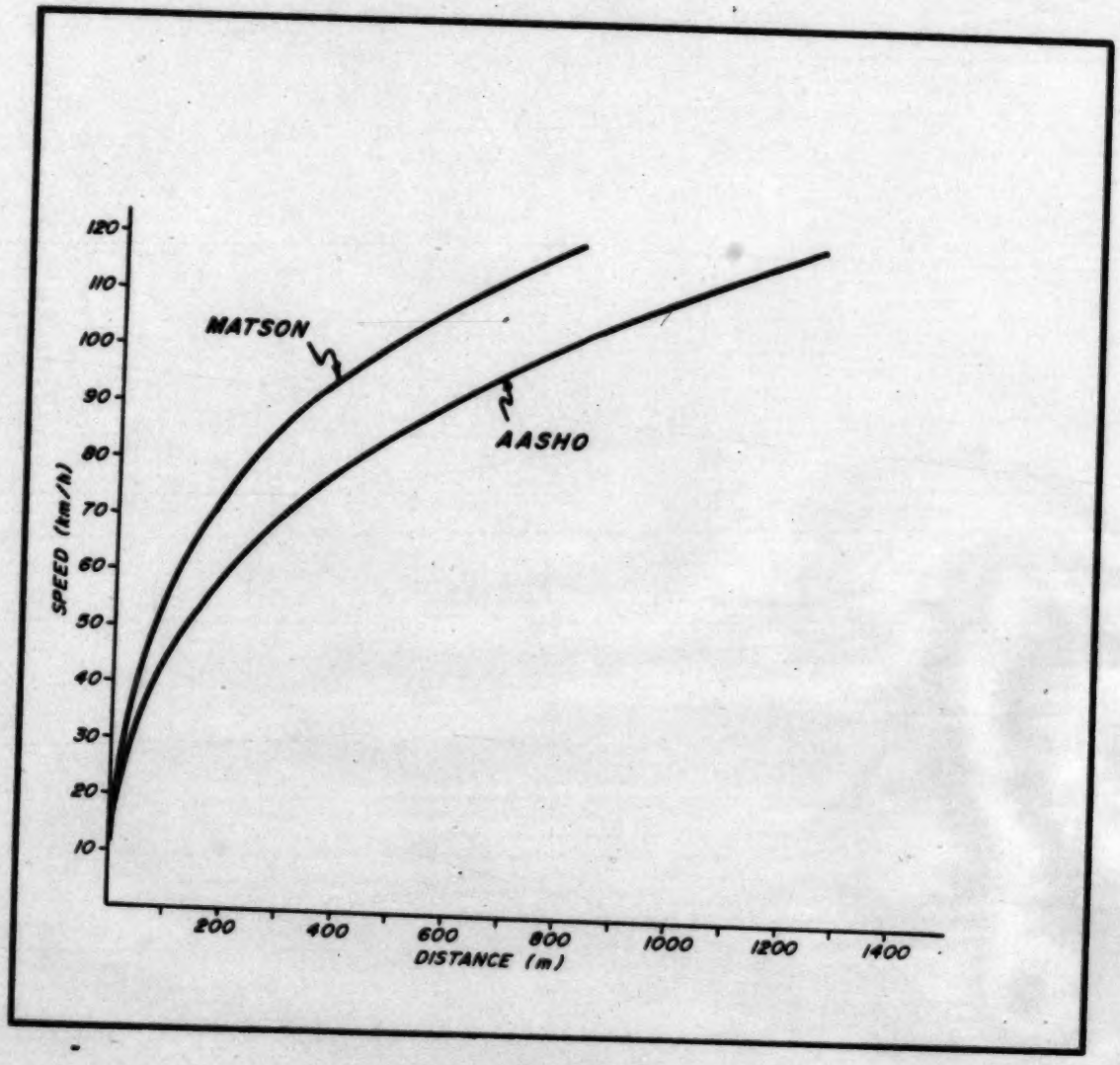


Figure 3.5 AASHO AND MATSON SPEED-DISTANCE CURVES

Uniform decelerated motion ($v_f = 0$):

$$v_o = dt$$

$$v_o = \sqrt{2dl}$$

Conversion of deceleration rate from metres per second per second to kilometres per hour per second:

$$D = 0.2778d$$

Where:

d =deceleration rate in metres per second per second

D =deceleration rate in kilometres per hour per second

v_f =final velocity in metres per second

v_o =initial velocity in metres per second

l =distance in metres

t =time in seconds

3.3.2 VEHICLE DECELERATION RATES

As with acceleration rates, vehicle deceleration rates most widely used for design purposes are also located in the American Association of State Highway Officials manual: A policy on the Geometric Design of Rural Highways(1). Both the Urban Highway Design Guide and the Roads and Transportation of Canada have developed deceleration rates based upon those recommended in the American Association of

State Highway Officials manual.

Two types of deceleration rates are used in the calculation of deceleration lanes; deceleration while in gear, i.e. removing one's foot from the accelerator pedal and; decelerating with the use of the vehicle's brakes.

American Association rates for passenger vehicles in gear were determined from a series of trial runs and assumed to be appropriate for the design of deceleration lanes(1). The overall deceleration rates were plotted and converted into the more usable form in Figure 3.6, which shows the distance travelled and the speed reached during a given period of time for deceleration in gear from any speed.

In determining the distances travelled in decelerating while braking, American Association of State Highway Officials used observations made on vehicles approaching a stop condition rather than use deceleration characteristics while actually approaching the controlling curve on an exit ramp. They felt that this comparison could be made because in both instances, the braking action is predetermined and the deceleration basically follows a similar pattern. The results of the study have been plotted and exhibited in Figure 3.7. This figure illustrates the distance travelled and the speed reached while braking at "comfortable" and "leisurely" rates.

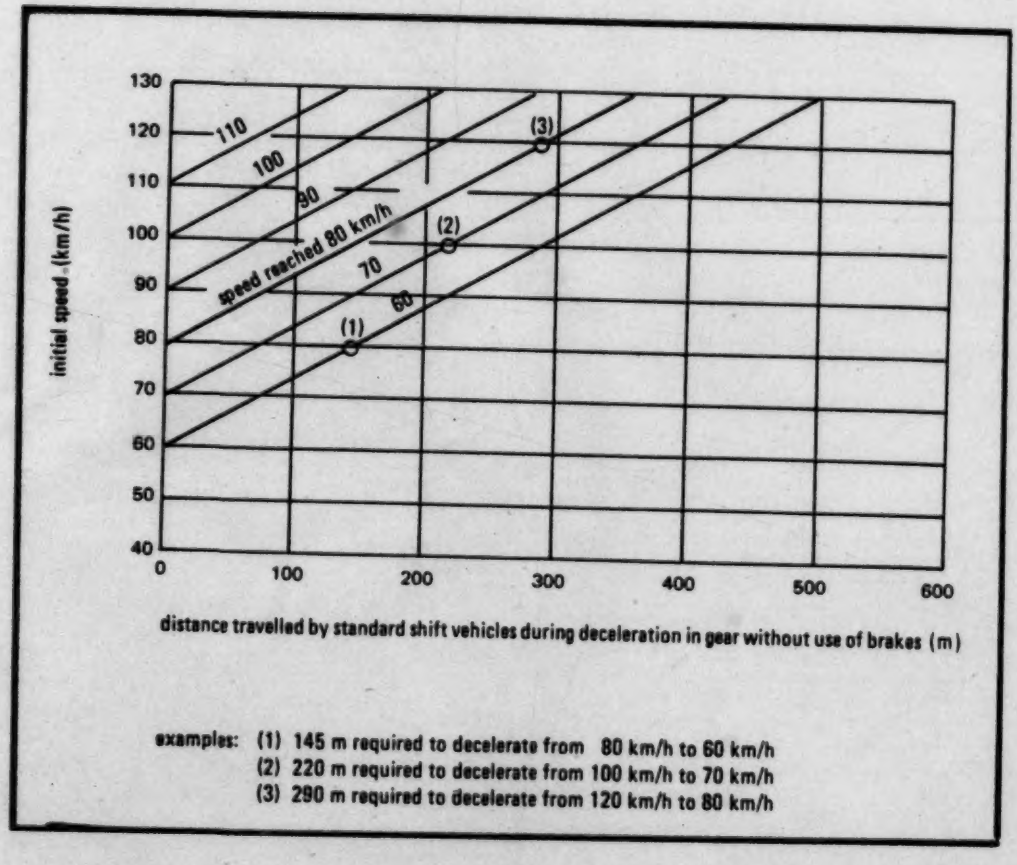


Figure 3.6 DISTANCE TRAVELLED WHILE DECELERATING IN GEAR

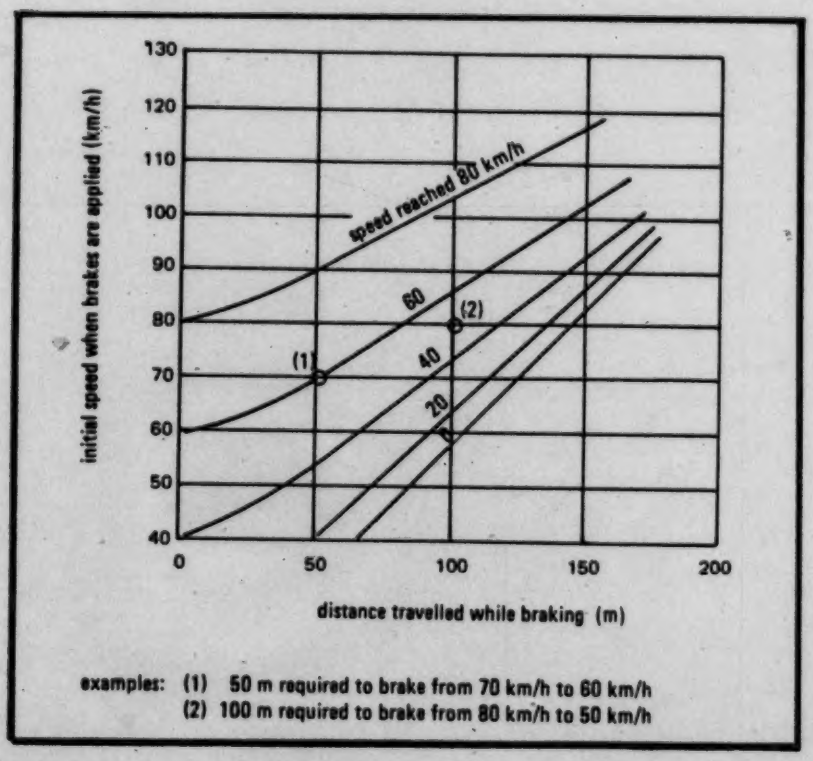


Figure 3.7 DISTANCE TRAVELLED WHILE BRAKING

4. RAMP TERMINAL DESIGNS

4.1 ACCELERATION LANES

The required length of an acceleration lane is based upon three factors in combination:

1) the speed at which drivers merge with the through traffic,
2) The speed at which drivers enter the acceleration lane, and
3) The manner of accelerating or the acceleration factors.

The length of acceleration lanes may also depend on the relative volumes of through and entering traffic. Long acceleration lanes are desirable on high volume roads to enable entering vehicles to merge with the through traffic without the mainline traffic being required to reduce speeds. Entering vehicles can continue in motion and regulate their speed while travelling parallel with the through traffic until an opening enables them to move into the through traffic lane.

When a driver enters the through pavement from an entrance ramp, desirably, his speed should approximate that of the through traffic and consequently, the design can be based on an entering speed equal to the average running speed of traffic on the highway. The speed at which the average driver may be expected to enter the acceleration lane is the average running speed as related to the radius

of the curves on the ramp entering the acceleration lane. The average running speeds on through highways and ramp curves were exhibited on Table 2.1. The difference between the average running speed on the entrance curve and that on the highway is the differential which determines the length of the acceleration lane.

Lengths of acceleration lanes are based on passenger vehicle operation as trucks and buses generally require much longer distances to accelerate, and lengths based on these vehicles would be longer. A slower entry of trucks and buses is unavoidable and generally accepted by the travelling public. Where a substantial number of large vehicles are to enter a high speed facility, acceleration lengths should be increased, or the entry located on a downgrade if feasible.

As stated previously, it is desirable to design an entrance ramp terminal such that drivers can merge with the through highway traffic at approximately the same speed as the average running speed of the through highway. Lengths derived using this basic assumption are often quite long and as shown by the ramp design standards in the following sections, it is satisfactory for vehicles from the acceleration lane to merge with the through vehicles at a speed of approximately 10Km/h less than the average running speed of the through highway.

4.1.1 CANADIAN ENTRANCE RAMP DESIGN STANDARDS

The design for entrance ramps are premised on the following philosophies.

1) Vehicles entering the mainline must be able to travel on a natural path.
2) In order to permit the acceleration of vehicles from the controlling ramp curvature speed to the mainline through traffic speed, sufficient acceleration distances must be provided.
3) An adequate merging manoeuvre length must be provided enabling drivers to select a gap, in the adjacent through traffic stream, and merge safely without appreciable speed interference.

Both the direct taper and parallel lane designs are used in Canada to meet the foregoing requirements. The tapered design is gaining wider acceptance across the country as experience indicates that it best fits the natural path of an entering vehicle. Only a few provinces use the parallel lane design for economical or traditional (uniformity) reasons.

4.1.1.1 URBAN HIGHWAY DESIGN GUIDE STANDARDS

Lengths of acceleration lanes developed in the Urban Highway Design Guide (UHDG)(33) are based on two different criteria: minimum and desired acceleration lengths. Minimum acceleration lengths are developed based on acceleration from the average running speed on the ramp controlling curve

to 10 km/h less than the main line average running speed. Desirable acceleration lengths are based on the premise that vehicle speeds are at or are close to the design speed. Minimum and desirable acceleration lengths are shown in Table 4.2

Figure 4.1 shows a typical design of an entrance ramp terminal. The acceleration length is the distance from the end of the controlling ramp curve to the point at which the speed change lane is 3.75m wide. A spiral transition (Ls), a length of tangent (T), and the merge distance (M) make up the acceleration length (A).

The important feature of this design is the merge distance (M) which is measured from the wedge point (beginning of the wedge) to where the merging lane is 2m wide. The development of the merging length is premised on three controls:

1) The time required to find and enter an acceptable gap.
2) Angle of convergence (A).
3) The width of the pavement at the wedge point.

These parameters determine the requirements for the merge distance which varies according to the design speed of the mainline facility. The higher value being applicable for higher speeds and associate traffic conditions. On high speed highways the effectiveness of an acceleration lane is dependent upon the length available for merging, as well as the total acceleration length.

Table 4.1 URBAN HIGHWAY DESIGN GUIDE, MINIMUM AND DESIRABLE ACCELERATION LENGTHS

HIGHWAY DESIGN (km/h)	RUNNING SPEED (km/h)	RAMP DESIGN SPEED (km/h) 20	30	40	50	60	70	80	90
		RAMP RUNNING SPEED (km/h) 20	27	35	40	54	63	71	78
60	44	70	60	35	15	-	-	-	-
70	53	125	115	90	65	-	-	-	-
80	61	195	180	150	125	50	-	-	-
90	68	265	250	220	195	115	40	-	-
100	76	355	340	315	290	200	135	85	-
110	92	560	545	515	505	425	360	285	205

HIGHWAY DESIGN (km/h)	RUNNING SPEED (km/h)	RAMP DESIGN SPEED (km/h) 20	30	40	50	60	70	80	90
		RAMP RUNNING SPEED (km/h) 20	30	40	50	60	70	80	90
60	50	105	90	50	-	-	-	-	-
70	60	185	165	115	70	-	-	-	-
80	70	285	265	215	165	100	-	-	-
90	80	400	385	340	285	220	125	-	-
100	90	535	510	480	430	385	275	150	
110	100	700	660	640	590	500	430	295	150

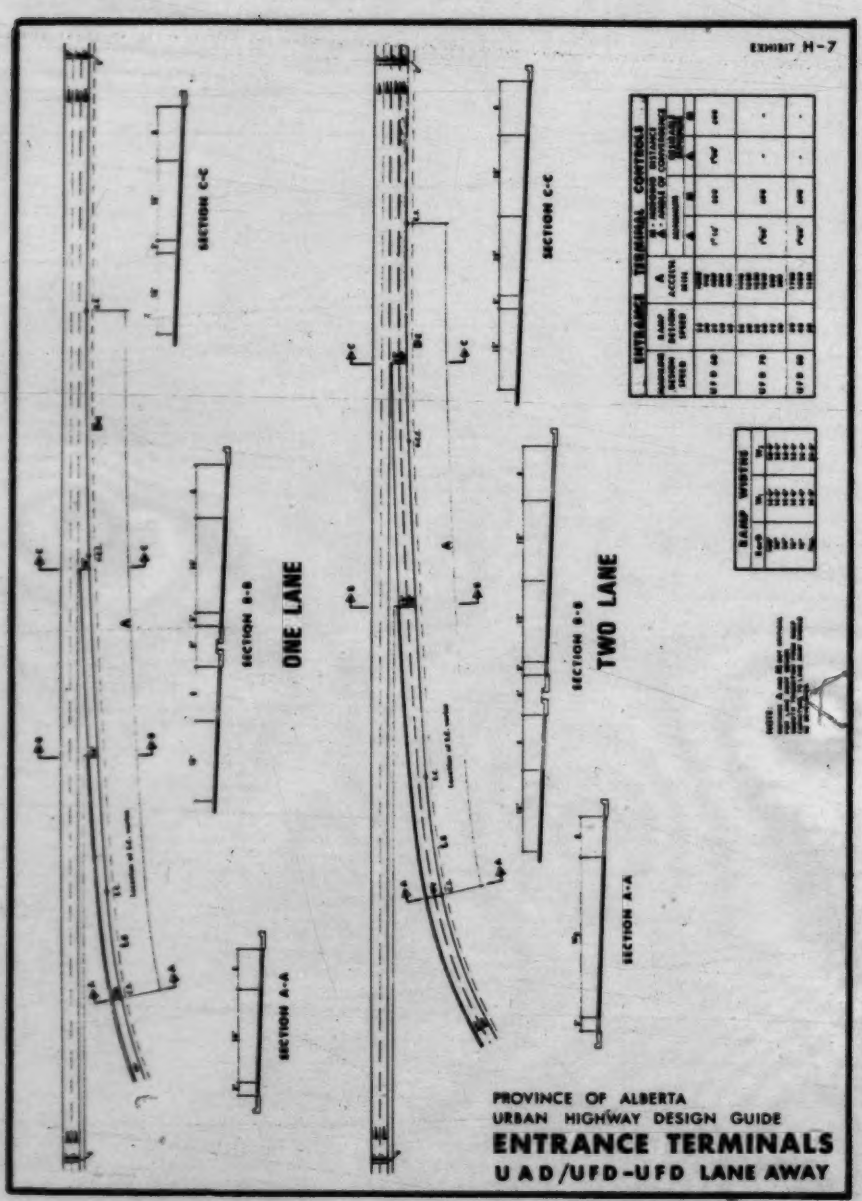


Figure 4.1 TYPICAL DESIGN OF AN ENTRANCE RAMP TERMINAL-UHDG

Another feature incorporated in this design is that the width of the entrance terminal is widened or flared between the merging end and 0.6m wedge in order to give the motorist some flexibility of driving path when approaching the merging area.

The total acceleration length is determined by combining the merging distance (M), the wedge length and the acceleration length from the merge end to the controlling degree of curvature on the ramp.

4.1.1.2 ROADS AND TRANSPORTATION ASSOCIATION OF CANADA STANDARDS

Lengths of accelerating lanes as developed in the Roads and Transportation Association of Canada manual (RTAC)(34) are premised on the following three factors in combination:

1) The speed at which drivers merge with the through traffic,
2) The speed at which drivers enter the acceleration lane,
3) The manner of accelerating.

The speed at which the driver enters the through traffic stream is taken to be 8 km/h less than the average running speed of the highway. The speed at which the driver enters the acceleration lane is taken to be the average running speed for the radius of the ramp curve.

Table 4.3 shows design values for lengths of acceleration lanes. For the parallel lane, the values in the

Table 4.2 ACCELERATION LANE LENGTHS-RTAC

HIGHWAY DESIGN SPEED (km/h)	RUNNING SPEED	RAMP DESIGN SPEED (km/h)						
		20	30	40	50	60	70	80
60		95	80	60	20	-	-	-
70		150	135	105	70	20	-	-
80		220	205	175	135	85	-	-
90		290	270	240	205	150	70	-
100		365	350	330	285	230	150	70
110		455	440	410	380	330	245	165
120		540	525	500	470	425	350	280
130		610	595	570	550	520	455	380
140		670	660	640	625	600	565	510

table refer to the lengths of acceleration lane excluding the length of taper. For the direct taper form, the values shown refer to the length from the end of the ramp curve to the point at which the auxilliary lane is 3.5 m wide.

Typical direct taper and parallel lane entrance terminal designs are illustrated in Figures 4.2 and 4.3.

4.1.2 AMERICAN ENTRANCE RAMP DESIGN STANDARDS

American standards(2) for acceleration lengths are based directly on the philosophies as dictated by the American Association of State Highway Officials. Acceleration lengths are determined on the basis of the entering vehicle merging with the through traffic at approximately 8 km/h less than the average running speed of the through traffic. The initial speed of the ramp vehicle is taken as being the average running speed of the controlling ramp curve. Table 4.4 shows the acceleration lengths derived based on the above assumptions.

4.1.3 EUROPEAN ENTRANCE RAMP DESIGN STANDARDS

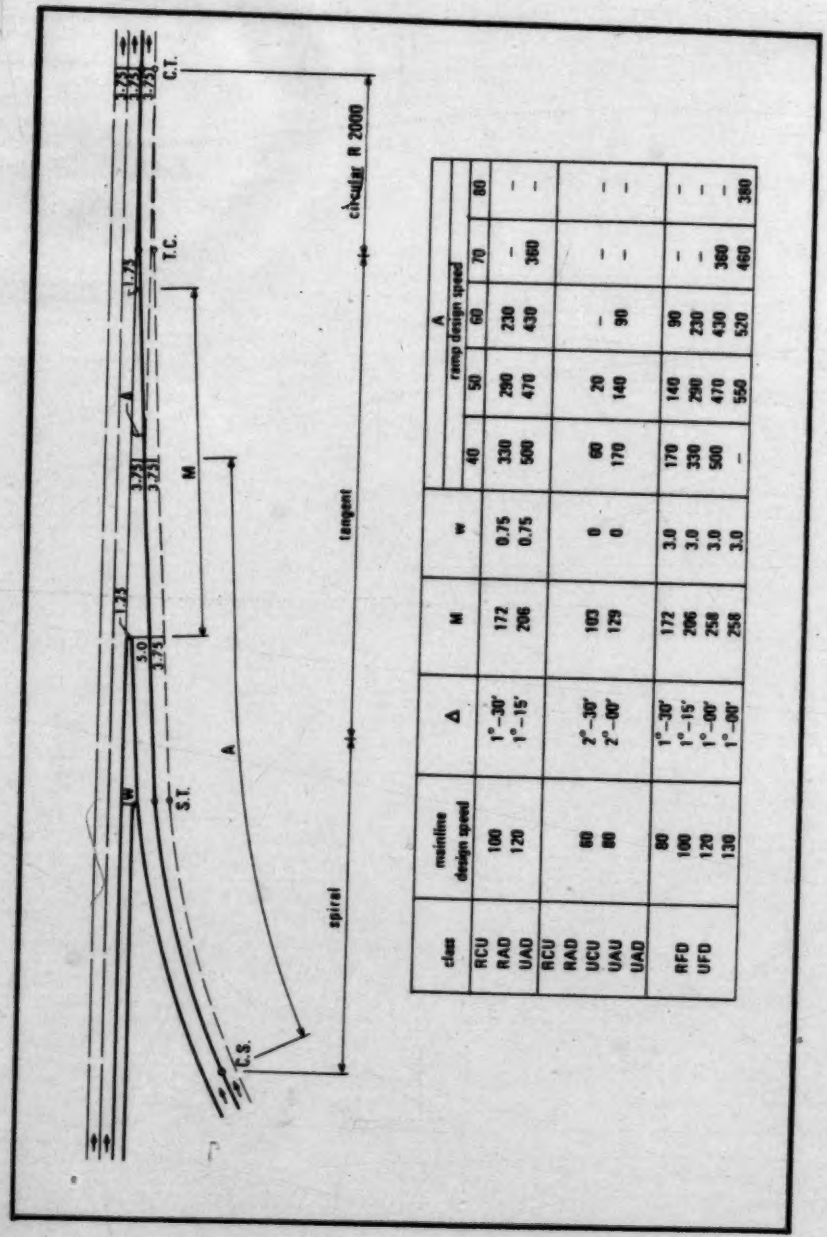
4.1.3.1 BRITISH DESIGN STANDARDS

The design of entrance terminals in the United Kingdom(22) are premised on the following philosophies:

1) An acceleration lane should be designed so that the vehicles turning left from the major road are at approximately the same speed as that of the nearside lane traffic waiting to merge.

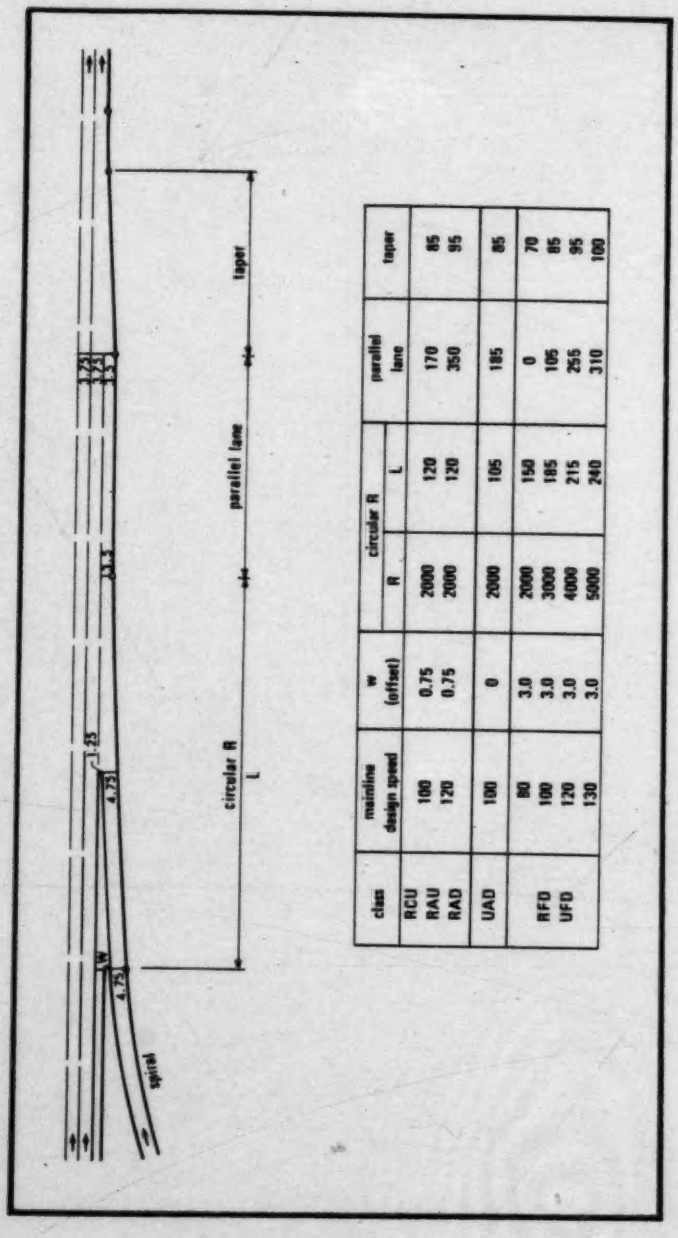
Table 4.3 ACCELERATION LANE LENGTHS-AASHO

HIGHWAY DESIGN SPEED (km/h)	RUNNING SPEED	RAMP DESIGN SPEED (km/h)					
		30	40	50	60	70	80
50		-	-	-	-	-	-
60		75	65	45	-	-	-
70		200	175	150	50	-	-
80		325	300	275	180	120	50
100		455	430	405	310	250	175
110							



class	minimum design speed	Δ	M	w	A ramp design speed 40	50	60	70	80
RCU	100	1°–30'	172	0.75	330	290	230	–	–
RAD	120	1°–15'	206	0.75	500	470	430	380	–
UAD									
RCU	80	2°–30'	103	0	60	20	–	–	–
RAD	80	2°–00'	129	0	170	140	90	–	–
UCU									
UAU									
UAD									
RFD	80	1°–30'	172	3.0	170	140	90	–	–
UFD	100	1°–15'	206	3.0	330	290	230	–	–
	120	1°–00'	258	3.0	500	470	430	380	–
	130	1°–00'	258	3.0	–	550	520	460	380

Figure 4.2 TYPICAL DIRECT TAPER ENTRANCE RAMP TERMINAL-RTAC



class	mainline design speed	w (offset)	circular R		parallel lane	taper
			R	L		
RCU	100	0.75	2000	120	170	85
RAU	120	0.75	2000	120	350	95
RAD	100	0	2000	105	185	85
UAD	80	3.0	2000	150	0	70
	100	3.0	3000	185	105	85
RFD	120	3.0	4000	215	255	95
UFD	130	3.0	5000	240	310	100

Figure 4.3 TYPICAL PARALLEL LANE ENTRANCE RAMP TERMINAL-RTAC

(Note: Traffic in the United Kingdom is oriented in the opposite direction to traffic in North America). Acceleration must allow for maximum visibility, speed adjustment, and merging which should be carried out over as long a path as possible. The acceleration lane should be continuously tapered to encourage drivers to consider merging well before the end of the merging area.

2) Controlling ramp curvature is an important factor. An increase in the radius of the curve leading into the entrance terminal permits higher speeds at the entry to acceleration lanes and allows less acceleration length.

The configuration of the acceleration terminal has changed from a parallel design to a direct taper design. The basic design is illustrated in Figure 4.4.

The basic design consists of a continuous tapered section from a full lane width in vicinity of the merge end to zero at the edge of the mainline. The slope of the tapered section varies with length of acceleration lane. Since lengths of acceleration lanes increase with the design speed of the mainline, the slope of the tapered section becomes correspondingly flatter.

Recommended lengths of acceleration lanes for different mainline speeds are given in Table 4.4. In difficult conditions, the British may accept substandard lengths, but

Table 4.4 ACCELERATION LANE LENGTHS-UNITED KINGDOM

HIGHWAY DESIGN SPEED (km/h)	RUNNING SPEED (km/h)	RAMP DESIGN SPEED (km/h)					
		30	40	50	60	70	80
60	275	150	150	150	-	-	-
80		215	215	215	215	215	-
100		275	275	275	275	275	
110		365	365	365	365	365	365

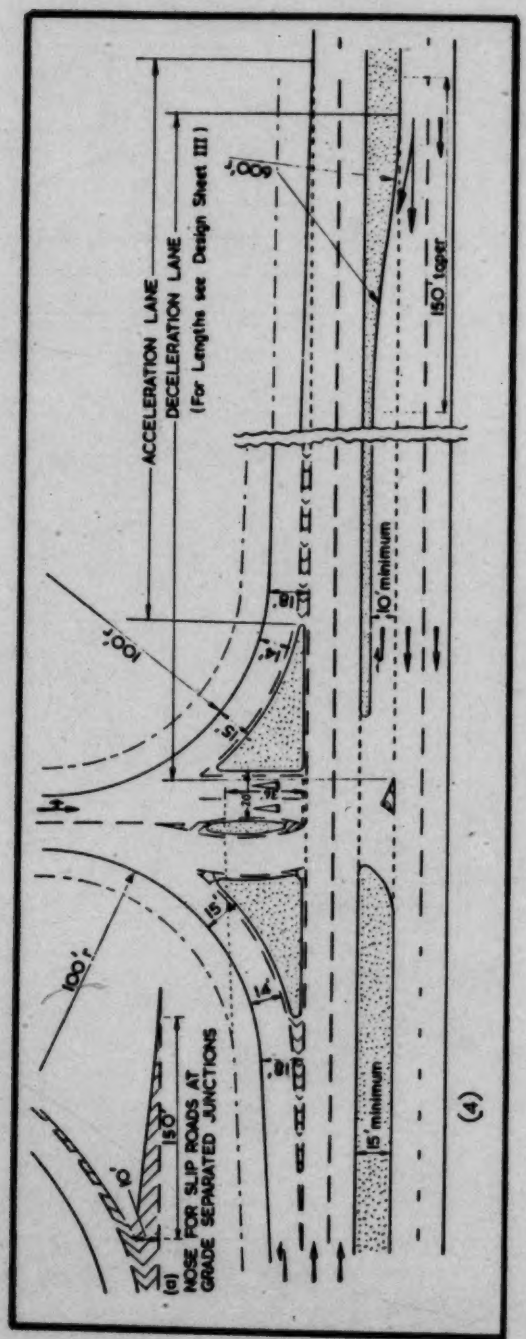


Figure 4.4 TYPICAL ENTRANCE RAMP TERMINAL-UNITED KINGDOM

never less than half those recommended in Table 9.

4.1.3.2 DUTCH DESIGN STANDARDS

The design of entrance terminals in the Netherlands(23) is premised on the following philosophies:

1) Vehicles entering the mainline should be able to adapt their speed to that of the major traffic before joining the mainline at an appropriate interval between two vehicles.
2) This entry in principle should only be effected at the right-hand side of a mainline.
3) Drivers on the acceleration lane and those on the mainline should be able to see each other over sufficient distance before reaching the merge end.

To achieve these principles the Dutch use the parallel type entrance terminal extensively throughout the country. Only under special circumstances, such as to provide better alignment and make delineation clearer for the driver, will tapered designs be considered. The majority of drivers in the Netherlands merge in the main stream shortly after the junction of the two carriageways, even in the case of very long acceleration lanes carrying heavy volumes of traffic. This condition must cause some problem with vehicles slowing down in the main through traffic lanes as there would be insufficient distance for entering vehicles to reach a high speed at the merge.

The design of entrance ramps are illustrated in Figure 4.5. The acceleration length normally provided for a motorway with a design speed of 120 km/h (75 mph) consists of a 250 m parallel lane. Shorter acceleration lanes are used for mainlines with design speeds of less than 120 km/h. If a taper design is considered the length over which the tapered lane adjoins the mainline is 250 metres for motorways with a design speed of 120 km/h. This length is also reduced when design speeds of motorways are less than 120 km/h.

The length of the acceleration lanes depends on the following factors:

1) The speed at which the subsidiary stream has to join the main one is assumed to be 75 percent of the design speed of the mainline.
2) The speed at the start of the acceleration lane is based on speed curve relationship.
3) The manner of acceleration and acceleration properties of the vehicles. An average acceleration rate of 1 metre per second per second (3.3 feet per second per second) is assumed.

Acceleration lanes are considered by the Dutch to start at the beginning of the transition curve at the end of the horizontal controlling curve on the ramp. They end where their width is still 3 metres but not further than 200 metres from the point where the two carriageways join (in

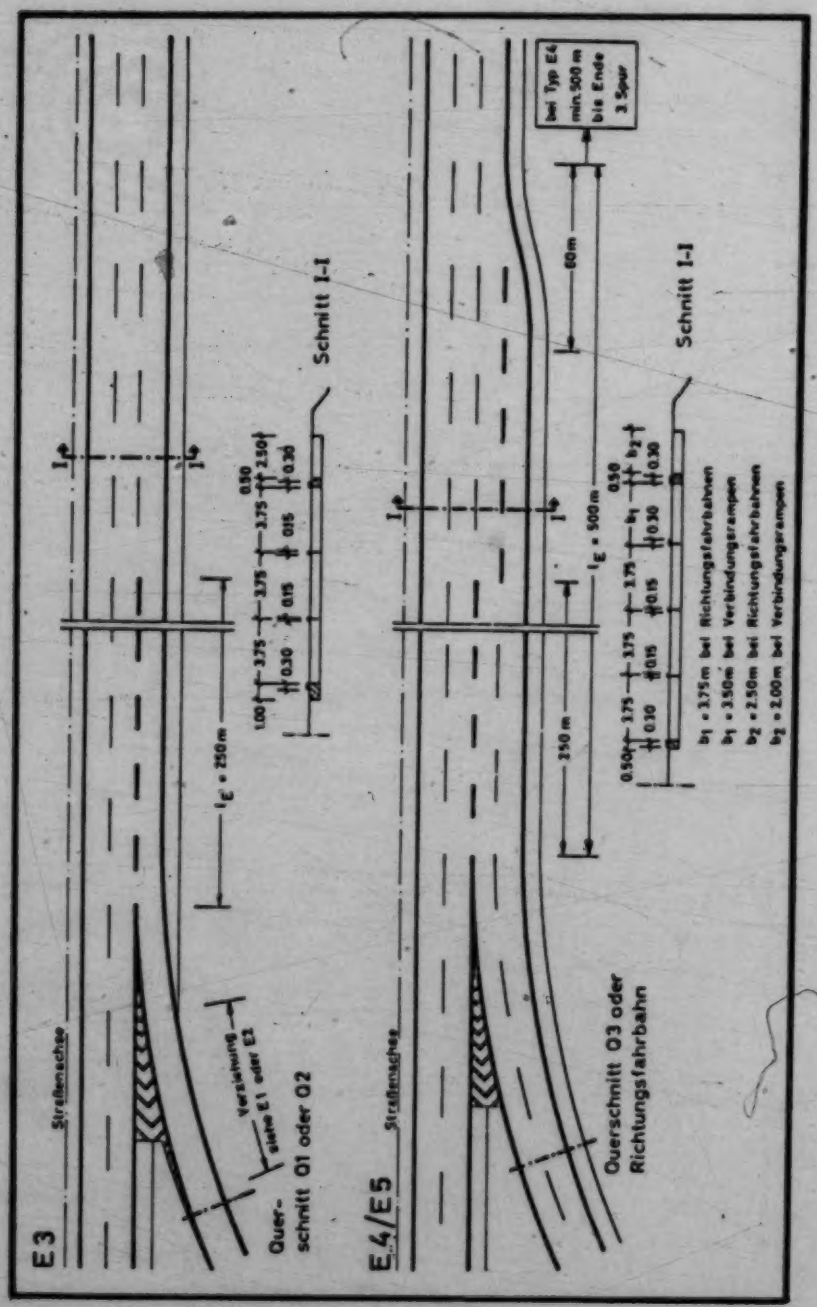


Figure 4.5 TYPICAL ENTRANCE RAMP TERMINAL-NETHERLANDS

the case of a parallel lane).

The length of an acceleration lane is based on the same formula that is used for computing deceleration lanes except the acceleration rate of 1 meter per second per second is used.

Based on this criteria the length of acceleration lanes for desirable and minimum values are summarized in Table 4.5.

The Dutch feel that it is essential to provide a sufficiently wide and properly paved hard shoulder along the mainline from the end of the entrance terminal to enable drivers to use it until a suitable gap presents itself in the main stream. To encourage the use of this escape lane a 1.5 meter gap is left in the markings at the end of the entry lane.

4.2 DECELERATION LANES

The length of deceleration lanes are based upon three factors in combination:

1) The speed at which drivers manoeuvre into the deceleration lane;
2) The speed of drivers in the deceleration lane;
3) The mannner of decelerating or the deceleration factors.

It is assumed assumed for design purposes, that drivers entering deceleration lanes travel at the average running

Table 4.5 ACCELERATION LANE LENGTHS-NETHERLANDS

	HIGHWAY DESIGN SPEED (km/h)	RUNNING SPEED (km/h)	RAMP DESIGN SPEED (km/h)					
			30	40	50	60	70	80
MIN	60	50	50	30	-	-	-	-
	80	60	100	75	50	-	-	-
	100	70	160	140	110	65	-	-
	110	85	230	210	180	115	70	-
DES	60	50	135	115	95	70	40	-
	80	60	205	185	155	90	95	
	100	70	310	290	265	195	155	105
	110	85	390	420	390	325	280	235

speed of the highway in accordance with the relation of design to average running speed.

The average running speed as related to the controlling ramp curve is a logical speed for the design of deceleration lanes. Thus, the difference between the average running speed on the highway and that on the controlling ramp curve is the speed differential which determines the length of the deceleration lane.

The deceleration of a vehicle as it approaches and enters an exit ramp is generally performed in two steps; first, the vehicle is slowed down without the use of brakes. In the second step, the vehicle brakes are applied. The vehicle speed at which drivers begin to apply their brakes when approaching an exit terminal varies widely, but indications are that drivers begin to apply their brakes sooner when they are travelling at higher speeds and when it is obvious that the approaching ramp controlling curve must be negotiated at a relatively slower speed. If the exit terminal is open to the driver's view, observations show that drivers release their accelerator pedals some time before applying their brakes.

Deceleration lane lengths are based upon passenger vehicle operation. Although trucks require longer distances to decelerate, for the same difference in speed, long deceleration lane lengths are not usually justified because average speeds of trucks are generally lower than those of passenger cars.

4.2.1 CANADIAN EXIT RAMP DESIGN STANDARDS

The design of exit ramps in the Canadian context are premised on the following philosophies:

1) Vehicles must be able to exit from the mainline in such a manner that no reduction in speed or other form of interference is imposed on the mainline traffic.
2) Vehicles leaving the mainline must be able to travel on a "natural path" without encountering any irregularities which might cause erratic operations of the vehicle.
3) Distances adequate for comfortable deceleration to the controlling curve speed must be provided.

Both the direct taper and parallel lane designs are used extensively in Canada to fulfill the foregoing criteria. However, highway authorities in each province tend to use one type of deceleration lane design more predominantly than the other. Recently the direct taper design has been gaining in popularity as it fits the natural path of the vehicle.

4.2.1.1 URBAN HIGHWAY DESIGN GUIDE STANDARDS

In predicting the behaviour of the driver on the exit ramp(33), the following factors are considered in order to discourage deceleration occuring on the mainline;

1) The points at which vehicles start to decelerate after they are clear of the mainline.

2) How vehicles decelerate, at what speed they are travelling when deceleration begins clear of the mainline.

A design that is considered to produce a relatively safe situation for most drivers assumes a 12.5 percent desirable and 35 percent minimum reduction of mainline design speed opposite the approach nose. This is shown in Figure 4.6.

Here no allowance is made for deceleration in gear and comfortable braking is assumed to begin at the wedge point in advance of the approach nose. Beyond the approach nose comfortable braking continues to the controlling degree of curve on the ramp. The braking distance is determined from Figure 3.7 using the 12.5 percent and 35 percent design speed reduction at the approach nose and the design speed of the controlling curve. Comfortable deceleration rates depicted on the graph are about 10 km/h/s at the higher speed range to 6.4 km/h/s the lower speed range.

An important feature of this design is the diverging distance (B) which is the tapered distance from where the ramp is 2m wide to the wedge point (beginning of the wedge). The diverging distance varies in accordance to requirements for proper divergence relative to varying design speed. As the design speed of the mainline increases so does the diverging distance.

A feature in the design of the exit terminal is that the lane width is widened or flared between the beginning of

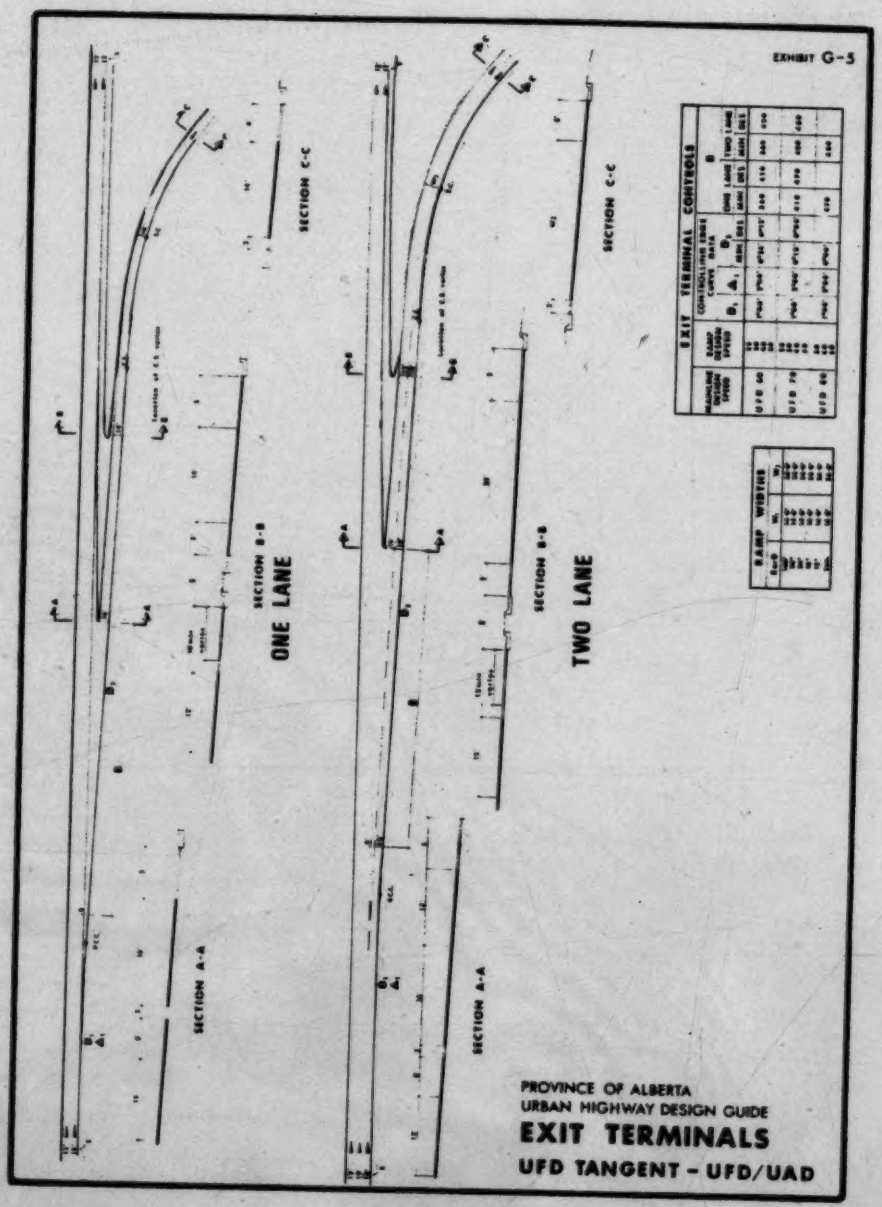


Figure 4.6 TYPICAL EXIT RAMP TERMINAL-UHDG

the painted wedge and the approach nose in order to give a funneling effect and some latitude in approach angle.

The total deceleration length is determined by combining the taper (B), the wedge length and braking distance as determined from Figure 3.7. The lengths derived are the basic minimum requirements assumed for deceleration lanes. However, these values may be increased in the final design depending on selection of length of spiral and it's location (C.S.) relative to the approach nose. Desirable and minimum lengths of deceleration were computed on this basis and are given in Table 4.6. The minimum values are premised on a 35 percent reduction of speed at the approach nose and desirable values are premised on a 12.5 percent reduction of speed at the approach nose.

4.2.1.2 RTAC STANDARDS

The length of deceleration lanes as dictated in the RTAC manual(34) are based on the same philosophies previously discussed in Section 4.0.

In determining the lengths of deceleration lanes, it is assumed that drivers travel at average running speed of the highway at the beginning of the deceleration lane. Drivers decelerate in gear for three seconds as they enter the deceleration lane and then brake at a comfortable rate until they have reached the average running speed as dictated by the controlling ramp curve.

Table 4.6 MINIMUM AND DESIRABLE DECELERATION LENGTHS-UHDG

	HIGHWAY DESIGN SPEED (km/h)	RUNNING SPEED (km/h)	RAMP DESIGN SPEED (km/h) 25	30	40	50	60	70	80
DES	60	50	200	195	185	165	-	-	-
	80	51	240	230	225	210	180	-	-
	100	63	300	295	285	275	245	225	210
	110	74	350	345	340	330	300	295	270
MIN	60	56	155	145	135	-	-	-	-
	80	70	170	165	150	140	-	-	-
	100	85	225	220	210	195	-	-	-
	110	98	280	270	265	240	215	200	-

Distances travelled during deceleration and braking were shown in Tables 3.6 and 3.7. Table 4.7 shows design values for lengths of deceleration lanes. For the direct taper form, the values shown refer to the length from the point at which the auxilliary lane is 3.5 m wide to the beginning of the ramp curve. For the parallel lane form, the values in the table refer to the length of deceleration lane excluding the length of taper.

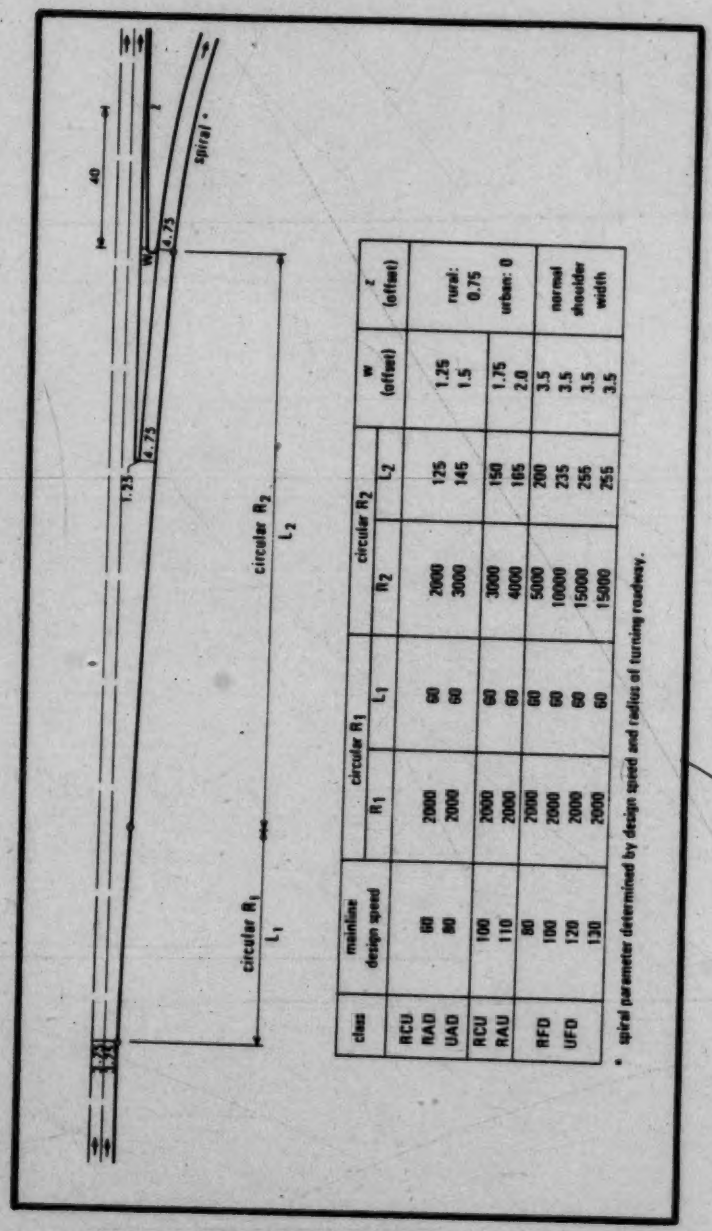
Figures 4.7 and 4.8 exhibit typical direct-taper and parallel lane exit ramp designs.

4.2.2 AMERICAN EXIT RAMP DESIGN STANDARDS

In determining the length of deceleration lanes(2) it is assumed that drivers will (a) travel at the average running speed of the highway at the beginning of the deceleration lane, (b) decelerate in gear for three seconds upon entering the deceleration lane and (c) brake at a "comfortable" rate on the deceleration lane, until they reach the average running speed of the ramp controlling curve. On the basis of the previously noted assumptions, distances travelled during deceleration and the established speed relationships, deceleration lengths for exit ramps are established. The resulting lengths suggested for design purposes are shown in Table 4.8.

Table 4.7 DECELERATION LANE LENGTHS-RTAC

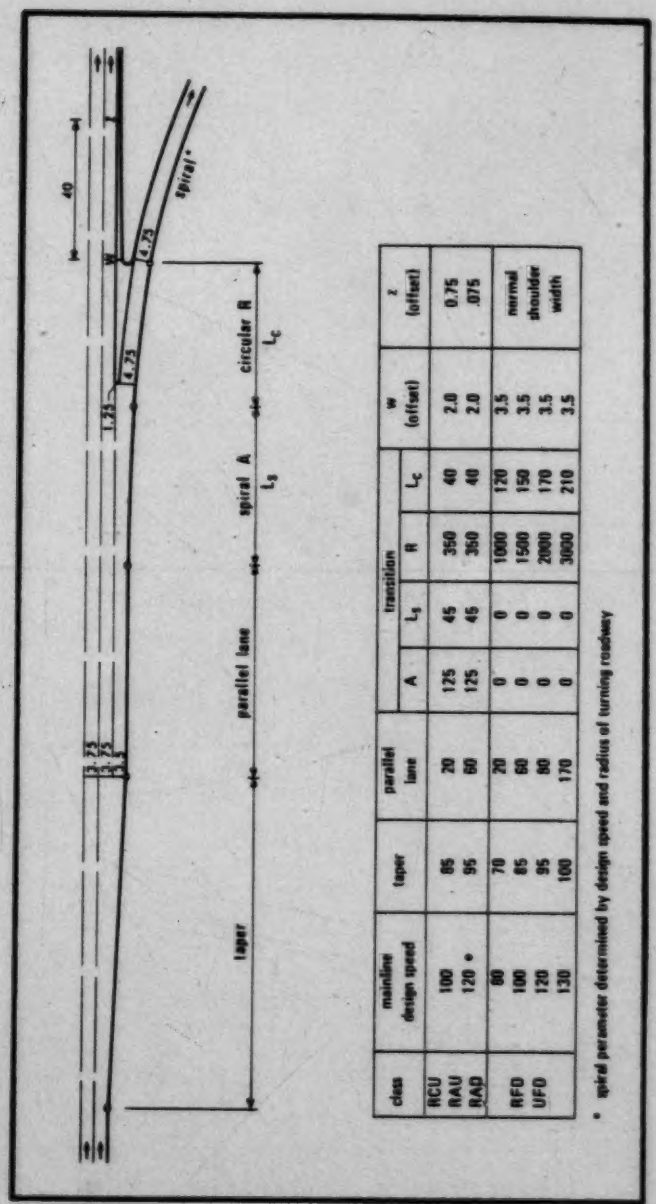
HIGHWAY DESIGN SPEED (km/h)	RUNNING SPEED	RAMP DESIGN SPEED (km/h)							
		20	30	40	50	60	70	80	
60		85	80	70	55	-	-	-	
70		105	100	90	75	60	-	-	
80		120	115	105	95	80	-	-	
90		140	135	125	115	100	80	-	
100		160	155	145	135	120	100	-	
110		175	170	160	150	140	120	100	
120		190	185	180	170	155	135	120	
130		205	200	190	180	170	150	135	
140		220	215	205	195	185	165	150	



class	mainline design speed	circular R_1		circular R_2		W (offset)	Z (offset)
		R_1	L_1	R_2	L_2		
RCU RAD UAD	60 80	2000 2000	60 60	2000 3000	125 145	1.25 1.5	rural: 0.75 urban: 0
RCU RAU	100 110	2000 2000	60 60	3000 4000	150 165	1.75 2.0	
RFD UFD	80 100 120 130	2000 2000 2000 2000	60 60 60 60	5000 10000 15000 15000	200 235 255 255	3.5 3.5 3.5 3.5	normal shoulder width

* spiral parameter determined by design speed and radius of turning roadway.

Figure 4.7 TYPICAL DIRECT TAPER EXIT RAMP-RTAC



class	mainline design speed	taper	parallel lane	transition A	transition L_s	transition R	transition L_c	w (offset)	z (offset)
RCU	100	85	20	125	45	350	40	2.0	0.75
RAU	120 *	95	80	125	45	350	40	2.0	.075
RAD	60	70	20	0	0	1000	120	3.5	normal shoulder width
RFD	100	85	60	0	0	1500	150	3.5	
UFD	120	95	80	0	0	2000	170	3.5	
	130	100	170	0	0	3000	210	3.5	

* spiral parameter determined by design speed and radius of turning roadway

Figure 4.8 TYPICAL PARALLEL LANE EXIT RAMP-RTAC

4.2.3 EUROPEAN EXIT RAMP DESIGN STANDARDS

4.2.3.1 BRITISH DESIGN STANDARDS

The design of British exit ramp terminals(22) are premised on the following philosophies:

1) The driver should be encouraged to make a lateral move and then decelerate rather than be offered a combined deceleration and lateral movement option which may start in the mainline.
2) The design must always be considered from the drivers viewpoint and an aesthetic solution found.
3) The length of deceleration lanes should be sufficient for vehicles to slow down from the average running speed of traffic in the nearside lane to the speed necessary for negotiating the curve at the end of it. In order to make deceleration lanes effective the curve radius must permit a speed of at least 30 to 40 km/h (not less than 30 metres).

Deceleration lanes are probably more important than acceleration lanes since drivers have to slow down irrespective of traffic conditions around them (which may temporarily be at capacity levels).

The school of thought in the United Kingdom has changed considerably over the last 15 years. Until the 1960's there was a move to provide short, 60 meters deceleration lanes for turning movements on dual carriageways. This was soon

Table 4.8 DECELERATION LANE LENGTHS-AASHO

HIGHWAY DESIGN SPEED (km/h)	RUNNING SPEED	RAMP DESIGN SPEED (km/h)									
		25		30		40	50	60		70	80
30		55		50		60	-	-		-	-
60		90		80		70	55	-		-	-
80		125		115		110	95	70		55	-
100		150		150		140	130	105		90	75
110		180		175		170	155	130		120	100

discarded in favor of larger exit radii and properly designed deceleration terminals. The shape of the lane has also changed from a comparatively rapid taper (50 meters) followed by a full width lane to a continuously tapered section from zero to full lane width. The basic design is illustrated in Figure 4.9.

The basic design consists of a direct taper from zero at the edge of the mainline to full lane width in the vicinity of the approach nose where the controlling degree of curve is introduced. The slope of the taper varies depending on the length of deceleration lane.

The length of the deceleration lane is considered by the British to be sufficient for vehicles to slow down from the average speed of traffic in the nearside lane to the speed necessary for negotiating the curve at the end of it. The minimum radius of curvature of controlling curve on the ramp is 30 metres permitting a speed of 30 km/h to 40 km/h. Recommended lengths of the nearside deceleration lanes are given in Table 4.9. As shown, the length of deceleration lane varies with speed of mainline but not with controlling radius of curve on the turning roadway.

4.2.3.2 DUTCH DESIGN STANDARDS

The design of exit terminals in the Netherlands(23) is premised on the following philosophies.

1) A deceleration lane should at least be long enough for the actual turning off to be effected

Table 4.9 DECELERATION LANE LENGTHS-UNITED KINGDOM

HIGHWAY DESIGN (km/h)	RUNNING SPEED	RAMP DESIGN SPEED (km/h)					
		30	40	50	60	70	80
60		125	125	125	-	-	-
80		160	160	160	160	-	-
100		150	150	150	150	150	-
110		180	180	180	180	180	180

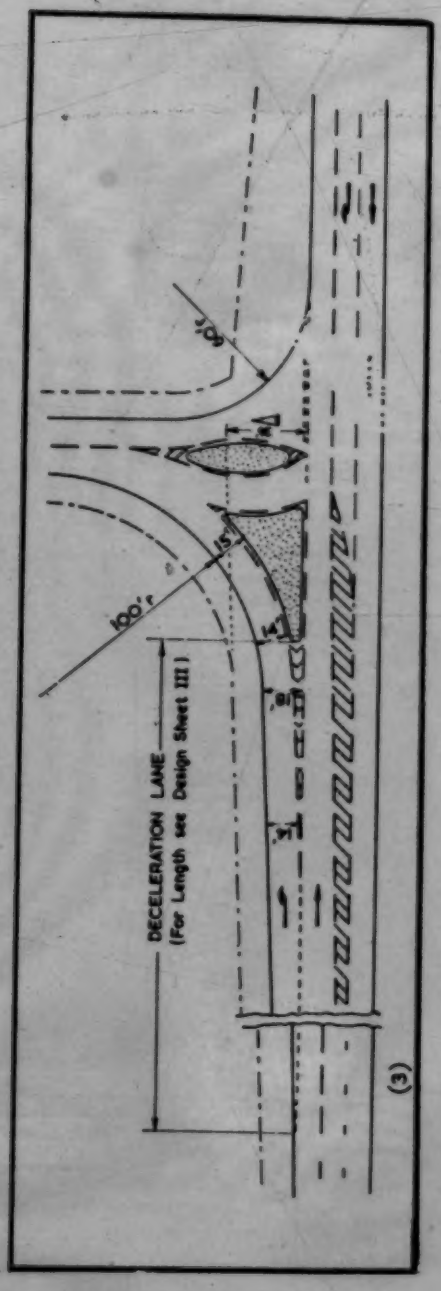


Figure 4.9 TYPICAL EXIT RAMP TERMINAL-UNITED KINGDOM

at no difference in speed, or only a very slight difference in speed between the turn off and the through traffic.

2) The road user should be able to form a clear idea of the manner and place of divergence and prepare himself accordingly, well before he reaches it.

3) With right handed traffic, turning movements should take place on the right of the through traffic stream to the maximum extent possible.

To achieve these principles, the Dutch promote the use of the parallel type lane since it has been extensively applied and only under special circumstances use the direct taper lane. For example a tapered design may be employed at the inside of a curve for specific clarity for the road user or along side the mainline with design speeds of less than 90 km/h. The Dutch recognize the tapered design as fitting most closely with actual driving behavior.

Typical designs for both the parallel lane and wedge shaped exit terminals are illustrated in Figure 4.10 for main motorways with design speeds of 90 km/h or less and 120 km/h.

If a direct taper is used along mainlines the deceleration lanes are not shorter than 200 meters corresponding with a taper of approximately 1:50. The taper increases with a design speed of the mainline. The deceleration lane is made 4.5 metres wide at the point where

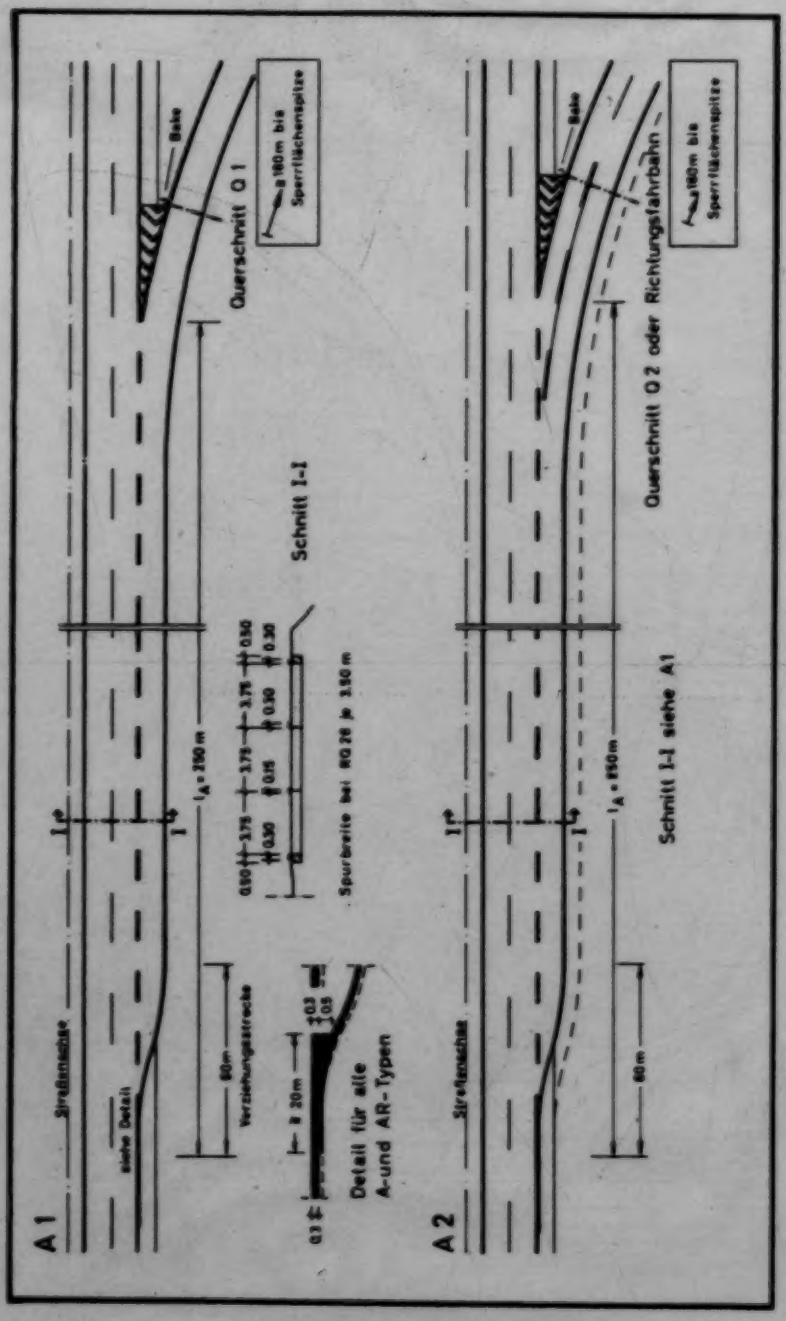


Figure 4.10 TYPICAL EXIT RAMP TERMINALS-NETHERLANDS

the carriageway separates from the deceleration lane to increase visibility. In addition a hard shoulder (panic strip) on either side (wide enough for a stationary vehicle to be passed) are provided on the deceleration lane.

The parallel lane design consists of a tapered section followed by a uniform section of normal lane width. The angle of the wedge between the main carriageway and the deceleration lane is less than 4 - 5 degrees and preferably not greater than about 2 degrees to enable drivers to turn off as smoothly as possible. The length of the initial wedge section varies in length according to the design speed of the mainline. These short tapered lengths are based on a time of 3.5 seconds which the majority of road users are found to need in order to switch from the right-handed lane of a mainline to a deceleration lane with the average speed of traffic on the mainline being 80 percent of the design speed.

The deceleration lane starts at the point where the taper is 3 metres wide (in the case of a parallel lane design) or 2 metres wide (for a direct taper). In both cases the deceleration lanes are assumed to end at the midpoint of the transition arc formed by the ramp turning off.

The Dutch take the following factors into account when determining the length required for deceleration lanes:

1) The speed at which vehicles exit is assumed to be 75 percent of design speed of the mainline.
2) The allowable speed at the end of the

deceleration lane is based on speed curvature relationship.

3) The manner of deceleration and the deceleration properties of the vehicle - comfortable retardation 1.5 metre per second per second and severe retardation 2.5 metres per second per second are used.

4) Whether or not there is a longitudinal gradient.

Lengths of deceleration lanes are summarized in Table 4.10. Desirable values are also indicated which assume no reduction of design speed of the through highway.

The Dutch also provide for drivers who do not leave the through highway until the last possible moment. Deceleration lengths based on a more severe retardation rate of 2.5 metres per second per second are used between the point where the exit ramp separates from the mainline to the midpoint of the transition arc formed by the ramp turning off.

4.3 DIRECT TAPER vs. PARALLEL LANE DESIGN

Exit and entrance terminals may be of two significantly different geometric shapes; parallel lanes with a nominal taper at the end of the lane or direct tapered designs. Initially, the parallel lane design was most popular and was in predominant use by most countries. However, with new research and experience(7, 8, 9, 17, 21, 26, 29, 31, 32, 42,

Table 4.10 DECELERATION LANE LENGTHS-NETHERLANDS

	HIGHWAY DESIGN SPEED (km/h)	RUNNING SPEED	RAMP DESIGN SPEED (km/h)					
			30	40	50	60	70	80
DES	60		35	20	-	-	-	-
	80		70	50	35	-	-	-
	100		105	90	95	30	-	-
	110		150	140	120	75	50	-
MIN	60		80	65	45	25	-	-
	80		140	120	100	60	30	-
	100		210	195	175	130	105	70
	110		290	280	260	215	185	155

43) most countries have shifted toward the use of direct taper designs. This change has evolved in the majority of the Canadian provinces and in the United Kingdom. The Dutch are still persistent in retaining the parallel design simply because it has been used extensively in the Netherlands and uniformity of design is considered essential.

Even today opinions differ on which design is preferential. There are advantages and disadvantages with either design.Several of the key issues are briefly presented in the following paragraphs.

The parallel lane design operates quite differently than the direct taper design(7). In the exiting operation of the parallel lane design, the driver is required to shift one lane to the right in a reverse path, then decelerate on an auxilliary lane of uniform width parallel to the through traffic lanes until the approach nose is reached where the exit ramp is separated from the through traffic lanes. This reverse movement is considered unnatural for the majority of drivers and when forced to choose their exiting path, a more continuous path requiring one turn of the steering wheel is preferred. Due to this unnatural manoeuvre inherent in any parallel lane, the deceleration terminal is considered somewhat inefficient as a large portion of the exit terminal (deceleration lane) becomes unused. If the full length of the deceleration lane is not properly used, a driver must either decelerate on the through lanes creating interference with mainline traffic or otherwise encounter uncomfortable

if not hazardous operation on the exit ramp proper.

This tendency has been proven by studies on Dutch motorways where a large percentage of drivers exited well beyond the nominal tapered section thereby not fully utilizing the full length of the deceleration lane. These results have led to the Dutch adding some extra length to the deceleration lane beyond the approach nose for drivers who leave the through lanes at the last possible moment. This is considered to be a good feature and is only necessary for the parallel lane design.

When traffic volumes are large and speeds correspondingly slow, it has been reported that there is a tendency for more drivers to utilize more of the deceleration lane following a reverse curve path. Even though a driver exits at the appropriate location on the nominal taper of the parallel lane, there is the chance that he may be cut off by a second vehicle exiting at the last minute ahead of the first vehicle, thus causing friction on the terminal. To be assured that a parallel lane exit terminal operates effectively, it is essential that motorists fully understand how they operate and how to use them as there are no physical warnings of the conditions ahead on the ramp proper. Although parallel lane exit terminals may cause some operational problems, there is still reason to believe that these types of designs are functional provided that motorists understand their operation and that the designs are of appropriate

standards(8).

Another point of interest when considering parallel lane designs is that they are usually quite compact and are more economical when the exit terminal encroaches on grade separation structures.

The direct taper design on the other hand, fits the natural path of the majority of drivers and has a "flushing" effect which encourages exiting traffic to maintain their full speed until they are clear of the through traffic lanes. This effect eliminates any friction or turbulence on the through traffic. It has been reported in many studies that the direct taper design fits a drivers general behaviour and traffic characteristics. The tapered design that best fits the natural path preferred by most drivers is particularly advantageous for major high speed facilities where the speed differential between the highway and the ramp are substantial. On a properly designed tapered exit ramp, only a small portion of the deceleration operation is required before the vehicle reaches the approach nose of the exit terminal. The majority of deceleration occurs immediately beyond the approach nose through the spiral transition which is positioned to provide physical warning of the upcoming ramp controlling curve. An exiting operation performed in this manner is considered to be highly efficient and preferred as it meets the natural aspirations of the majority of drivers and encourages that deceleration occur off the through lanes of the mainline facility.

The operation of an entrance ramp terminal is different from that of an exit terminal(31). A driver entering a mainline facility must execute several operations simultaneously. When entering the merge area from an entrance terminal a driver must concentrate on accelerating his vehicle speed up to or close to those speeds encountered on the mainline facility, look for a suitable gap in the through traffic stream, choose a suitable gap and manoeuvre his vehicle into it. The drivers preoccupation with all these activities makes merging standards extremely important in producing an effective design. Appropriate standards concerning the angle of approach, the length of the acceleration lane and the length of the merging area are key factors in the effective operation of an entrance ramp terminal.

Although the operations between entrance and exit ramps differ, design configurations are similar. Parallel lane designs with a nominal taper at the end of the acceleration lane and direct taper designs are also used.

The sharpest criticism of the parallel lane design when used for entrance ramps is that the angle of approach immediately beyond the merge end is often quite sharp encouraging drivers to merge prematurely into the through traffic stream(11). This results in some traffic not fully utilizing the entrance terminal in order to properly accelerate to the approximate speed of the through traffic. Such a condition causes turbulence in the through lane

adjacent to the parallel lane as early departure from the parallel lane implies that these vehicles must complete their acceleration on the mainline facility thus causing interference with the through traffic stream.

This condition was confirmed by another Dutch study on the utilization of parallel entrance terminals carrying heavy traffic volumes. In the Netherlands, many drivers merge into the main traffic stream shortly after passing the merge end of the entrance ramp. Even in cases where long parallel acceleration lanes have been provided, a major portion of the acceleration lane was found to be used only by a small proportion of drivers.

As with the case of tapered exit designs, the tapered entrance design is preferred as it fits most closely the path of drivers as well as encouraging the full use of the entrance terminal. In the tapered design the angle of convergence is extremely flat providing a long merging length and a flat projectory in advance of the merge end. The tapered design is considered to permit entering traffic to merge directly and uniformly with the mainline traffic. At the end of both the direct taper and the parallel lane entrance terminals, the mainline shoulders should be encouraged to be used for the merging operation if a suitable gap in the mainline does not materialize before this point. The Dutch encourage this type of operation with the use of special pavement markings.

Although a great deal of research and study has been done on entrance and exit ramp terminal designs, opinions differ widely on which one of the two designs are preferred. The advantages and disadvantages of one type of design over another is not that abundant and both types of configurations are considered quite functional. Clearly, there are two distinct and important factors in the operational success of an entrance or exit ramp design, the quality of the design and the drivers knowledge of how to use them properly.

4.4 COMPARISON OF GEOMETRIC STANDARDS

The lengths of acceleration and deceleration lanes for the countries surveyed are summarized in Tables 4.11 and 4.12. A subjective ranking was applied to each design standard and the ranking of the standard is illustrated in Figure 4.11. A general trend that can be easily deduced from Figure 4.11 is that the Canadian standards are generally the highest, the Dutch minimum standards the lowest, with the remaining standards falling somewhere in between.The difference in designs could be a reflection of the space availability to construct ramp terminals(14).

4.4.1 ACCELERATION RAMP DESIGN STANDARDS

When comparing ramp accelerating designs the Canadian standards rank fairly low for the lower design speeds but

Table 4.11 SUMMARY OF LENGTHS OF ACCELERATION LANES

HIGHWAY DESIGN SPEED (km/h)	AGENCY	RAMP DESIGN SPEED (km/h) 30	40	50	60	70	80	RANK
60	UHDG (min)	60	35	15				6
	(des)	90	50					5
	RTAC	80	60	20				4
	AASHO	75	65	45				3
	BRITISH	150	150	150				1
	DUTCH (min)	50	30					7
	(des)	135	115	95	70	40		2
80	UHDG (min)	180	150	125	50			6
	(des)	265	215	165	100			2
	RTAC	205	175	135	85			4
	AASHO	200	175	150	50			5
	BRITISH	215	215	215	215	215		1
	DUTCH (min)	100	75	50				7
	(des)	205	185	155	90	45		3
100	UHDG (min)	340	315	290	200	135	85	3
	(des)	510	480	430	385	275	150	1
	RTAC	350	330	285	230	150	70	2
	AASHO	325	300	275	180	120	50	5
	BRITISH	275	275	275	275	275	275	6
	DUTCH (min)	160	140	110	45			7
	(des)	310	290	265	195	155	105	4
110	UHDG (min)	545	515	505	425	360	285	2
	(des)	660	640	590	500	430	295	1
	RTAC	440	410	380	330	245	165	3
	AASHO	430	405	310	250	175		5
	BRITISH	365	365	365	365	365	365	6
	DUTCH (min)	230	210	180	115	70		7
	(des)	440	420	390	325	280	235	4

Table 4.12 SUMMARY OF LENGTHS OF DECELERATION LANES

HIGHWAY DESIGN SPEED (km/h)	AGENCY	RAMP DESIGN SPEED (km/h) 30	40	50	60	70	80	RANK
60	UHDG (des)	195	185	165				1
	(min)	145	135					2
	RTAC	80	70	55				4
	AASHO	80	70	55				5
	BRITISH	125	125	125				3
	DUTCH (min)	35	20					7
	(des)	80	65	45	25			6
80	UHDG (des)	230	225	210	180			1
	(min)	165	150	140				2
	RTAC	115	105	95	80			5
	AASHO	115	110	95	70	55		6
	BRITISH	140	140	140				3
	DUTCH (min)	70	50	35				7
	(des)	140	120	100	60	30		4
100	UHDG (des)	295	285	275	245	225	210	1
	(min)	220	210	195				2
	RTAC	155	145	135	120	100		5
	AASHO	150	140	130	105	90	75	6
	BRITISH	150	150	150	150	150		4
	DUTCH (min)	105	90	75	30			7
	(des)	210	195	175	130	105	70	3
110	UHDG (des)	345	340	330	300	295	270	1
	(min)	270	265	240	215	200		3
	RTAC	170	160	150	140	120	100	5
	AASHO	175	170	155	130	120	100	6
	BRITISH	180	180	180	180	180	180	4
	DUTCH (min)	150	140	120	75	50		7
	(des)	290	280	260	215	185	155	2

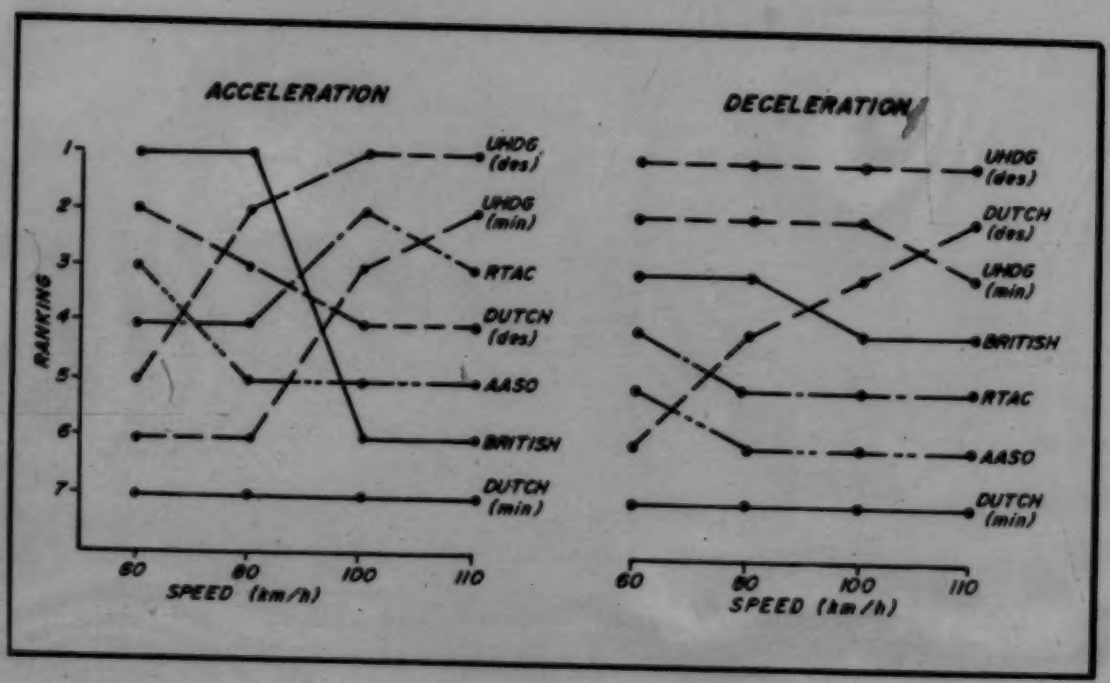


Figure 4.11 RANKING OF RAMP TERMINALS

are ranked the highest for the higher mainline design speeds. Although the minimum UHDG values rank fairly high compared to those of other countries they are absolute minimum and are only used in design where higher values can not be attained. More desirable values based on design speeds (no reduction in speed) are considered the upper limit. At the high range of design speeds lengths of acceleration lanes become very long and these standards may be difficult to achieve. The long lengths at higher speed differentials are due to the low acceleration rates experienced at high speeds. It is therefore apparent that although the minimum Canadian standards are high compared to other countries they may or may not meet the philosophies of adequate speed lane criteria. In any event, the appropriate values are given for the high and low extremes and it is left up to the designer to select the most practical solution.

The British standards rank the highest in the lower design speed range and then rapidly fall off to second last position for the higher design speed ranges. These standards are perhaps lower than indicated because the end of acceleration lane is measured at the end of the taper rather than at a point where there is a partial width (2 m) of auxiliary lane. The comparatively high standards at the lower design speed range and low standards at the high design speed range produces inconsistencies in designs that are not considered compatible with varying operating

conditions and appears inadequate in fulfilling the speed change requirements at the high design speed range where it is most needed. This along with the common design elements for varying operating conditions may indicate that there is a lack of sound criteria and full utilization of resources in adhering to British standards.

The minimum standards of the Dutch rank lowest relative to the standards of the other countries as illustrated in Figure 4.11. This is partly attributed to the assumed 25 percent reduction of design speed and severe acceleration rate of 3.54 km/h/s. Assumed desirable values based on no reduction in design speed were computed from the basic formula and these standards rated somewhat higher being between the Canadian and British standards. The Dutch appear to make compensation for the inadequacies in their standards by encouraging the use of the paved shoulder beyond the end of the deceleration lane. This aspect is discussed later on in the report under discussion of pavement markings.

4.4.2 DECELERATION RAMP DESIGN STANDARDS

The UHDG desirable standards for lengths of deceleration lanes are rated the highest when compared with other countries as shown in Figure 4.11 and appear to best fulfill the philosophies required for the exit terminal and ramp. These standards may become higher in the final design as lengths may be increased when employing varying lengths of transition curves and positioning the spiral relative to

the approach nose. The location of the spiral is generally in advance of the approach nose for the lower speed ranges and this condition is assumed in establishing the basic operational requirements.

It is also noted that RTAC and AASHO standards rated second lowest being between the Dutch and the British standards. This is due to the fact that the length of deceleration lengths are premised on running speeds rather than more realistic operation speeds which are today higher and on an upward trend.

The British standards for length of deceleration lanes are rated fairly high. It should be noted that British standards are lower than indicated because as with the acceleration lane, the beginning of deceleration lane is measured at the beginning of taper rather than at a point where there is a partial width (2 m) of auxiliary lane. One length of deceleration lane is used for all mainline design speeds. British standards yield higher standards in the lower design speeds and lower standards in the higher design speeds. Such conditions tend to produce roads that are over designed for lower speed facilities and under designed for higher design speed facilities where good standards are most needed. Furthermore it appears that since the British standards are so uniform that they would not be compatible for operating conditions that vary. The British standards appear to lack continuity, sound criteria and ability to fulfill the philosophies advocated for effective operation.

Dutch minimum standards for length of deceleration lanes are rated lowest of all standards. The low standards are partly due to the severe retardation rate of 11.6 km/h/s used by the Dutch compared to varying rates of 6.44 km/h/s to 9.98 km/h/s used to establish the Canadian standards. Furthermore, a reduction of 25 percent in design speed is also assumed. Since the Dutch measure the end of the deceleration lane at the midpoint of the transition curve formed by the ramp turning off there is a little extra length (approximately half of the transition curve) not accounted for. Nevertheless, the Dutch standards appear to be inadequate and incapable of fulfilling the philosophies advocated for effective operation.

The Dutch method, however, is quite flexible and may readily be adapted to varying conditions simply by varying some of the parameters. The equation was tested by assuming no reduction in design speed. The resulting values are arbitrarily referred to as desirable values as they represent the best values that the equation can produce without tampering with the constant or deceleration rate. Under the desirable condition of no reduction in the design speed, the deceleration lengths derived approach the higher Canadian standards.

5. THE RADAR SPEEDOMETER TECHNIQUE

5.1 INTRODUCTION

In order to complete the data collection phase of this project, it was decided to investigate the feasibility of utilizing a static observation method of data collection requiring the use of radar speedometers. Originally it was hoped that this study would observe passenger cars and light trucks in various acceleration and deceleration manoeuvres in both the urban and rural environment. However, it was realized that the amount of work involved in this type of investigation would be far greater than the scope of this study. Consequently, it was decided that the feasibility of the technique could be investigated if sufficient data on passenger cars and light trucks were obtained at three suitable on-ramp locations and four suitable off-ramp locations, located within close proximity to the City of Edmonton.

5.2 BASIC THEORY AND TECHNICAL FUNCTIONS OF THE RADAR SPEEDOMETER

5.2.1 FUNCTIONAL DESCRIPTION

A radar transmitter(36) produces high frequency radio energy. The spotlight antenna focuses this in a narrow beam in much the same way as a spotlight focuses light. The radar beam, like a light beam travels in a straight line and may

either be:

1) reflected or bounced back,
2) refracted or bent in passing through one substance into another,
3) absorbed by certain materials, or
4) transmitted by other materials.

Moving opaque objects, such as metal, stone, wood and concrete reflect the radar beam. Transparent material, such as glass and certain plastics, permit practically all of the beam to pass through, reflecting only a small amount. Other substances, such as leaves, grass, loose sand and earth absorb the radar beam to varying degrees.

The part of the transmitted radar beam reflected back to the receiver is used to "sense" the speed of an object at which the beam is aimed. Electronic circuits in the receiver and other parts of the instruments, then appropriately actuate the meter indicating the vehicle speed such that it can be read. However, this arrangement accurately indicates only the speed of objects moving directly toward or away from the radar transmitter/receiver.

Practically speaking, radar "sees" a metal pass in motion. It can detect a large mass or vehicle such as a truck or bus farther from the antenna than it can detect a smaller vehicle, such as a car.

5.2.2 TECHNICAL INFORMATION

Vehicle speed measuring radar consists of a radio transmitter and receiver, utilizing the "doppler principle" for operation.

Basically, the doppler principle deals with a change in pitch or tone (frequency) between a transmitter and receiver, one of which is in motion.

Sound waves easily explain the doppler principle. The example generally used to describe the doppler effect is the change in pitch of a horn of an approaching vehicle. As the vehicle passes, the pitch suddenly decreases. Actually, the doppler effect involves three relationships between the transmitter which produces the frequency and the receiver of the frequency.

Before continuing, an explanation of the terms frequency and wavelength will be helpful in understanding the doppler effect.

Frequency is the number of waves leaving a transmitter in a second and is measured in cycles per second, (C.P.S.). A wave is measured in terms of length, the longer the wave, the lower the frequency, the shorter the wave, the higher the frequency.

Returning to the example of the approaching vehicle, as the vehicle approaches, the sound of the horn is heard at a certain frequency, but because the vehicle is approaching, the actual horn frequency is not heard. As the vehicle passes, a definite change (lowering) in frequency is noted.

The frequency heard being lower than the actual frequency. The actual horn frequency will only be heard when the vehicle and the listener are stationary.

Therefore, when the distance between the transmitter and receiver is decreasing, the received frequency is higher than the transmitted. And when the distance between the transmitter and receiver is increasing, the received frequency is lower than the transmitted frequency.

The same physical principles used in the above example apply to doppler radar. In this instance, radio waves are substituted for sound waves and are called microwaves.

The radar beam consists of radio waves emitted from the antenna at a frequency of 10,525-mc at the speed of light (299,275 km/s). When an approaching vehicle enters the beam, the microwaves strike the vehicle and a small portion of the beam is reflected. Because the vehicle is in motion approaching the radar, more waves are received per second than transmitted. In effect, the approaching vehicle "compresses" the radio waves. The faster the vehicle speed or velocity, the more waves per second will be reflected back to the antenna.

This difference in frequency between the transmitted waves and the reflected waves is called the "doppler frequency" and this frequency is the same for either approaching or receding vehicles.

5.3 INTERFERENCE TO RADAR

Interference can effect the radar beam or it can enter the radar instrument through the power supply cable. Interference results in ghost or erratic meter readings. The degree of interference depends upon the closeness of the radar unit to the interference. Interference can affect the radar beam by reflection or scattering and modulation. As previously mentioned electrical interference from the vehicle's electrical system can enter the radar through the connecting cables, particularly the power cable, although this occurrance is rare.

Types of interference can be categorized under two headings: natural and man made interference.

Natural interference basically reflects and scatters the radar beam. Examples of natural interference are large trees, bushes moved by the wind and birds in flight. Heavy rain and snow will also scatter the radar beam. Examples of man-made interference include large advertising signs and neon signs.

5.4 ANGLE ERROR

In order for the radar unit to accurately determine vehicle speed, the angle between the antenna aim and the vertical line of travel should be as small as practicable, less than 10 degrees. Radar indication of vehicle speed and true vehicle speed increases as the angle

between the radar antenna and vehicle increases. The difference between the indicated vehicle speed and the true vehicle speed is less at lower speeds than at higher speeds. However, The radar indicated speed is lower than the actual vehicle speed.

6. SURVEY TECHNIQUES AND APPLICATIONS

6.1 VEHICLE PERFORMANCE SURVEY

6.1.1 CONSIDERATION IN SELECTING AN OPERATING SITE

As this study was intended to examine the feasibility of the radar technique, one set of the criteria in selecting an operating site was the suitability of the set-up location with respect to the technical requirements of the radar speedometer which have been previously discussed.

Specifically, it was necessary to orientate the speedometer emmitter/receiver as parallel as possible to the ramp under observation to ensure a minimization of the angle of error. It was also necessary to ensure that the performance of one vehicle at a time was observed. This latter requirement was more demanding as the radar beam cannot be tuned onto any one particular vehicle. As mentioned previously the radar speedometer unit responds when any moving target passes through the radar cone. As a result of this, when more than one vehicle is within the cone, output readings from the system are distorted. Thus one of the main criteria in the consideration of an operating site was the avoidance of this distortion.

The availability of a suitable parking location adjacent to the ramp from which to observe vehicles and the absence of natural or man-made interference formed other criteria in selecting a suitable set-up location.

The study locations were also selected to meet several geometric and traffic requirements. In the selection of both entrance and exit ramps, pure acceleration and deceleration situations were sought i.e., locations at which the traffic flow on the ramps was unaffected by upstream or downstream restrictions.

Prior to undertaking studies on any of the entrance or exit ramps, the operation at each site was evaluated to determine the approximate volumes and the possible effect of any upstream or down stream restrictions. In spite of this preliminary effort, the operation of the ramps during the actual speed studies was not always the same as during the initial field investigations, due to minor changes in traffic patterns. The entrance and exit ramps included in this study exhibit the following characteristics:

Entrance ramps;

1) diamond type ramps with excellent vertical and horizontal alignments, (downgrades of less than 4%)
2) high ramp operating speeds (although the legal speed limit was 60-70 km/h most vehicles accelerated into the 80 km/h range,
3) excellent merging conditions which eliminated any downstream restrictions,
4) no severe platooning effects were observed and the frequent occurrence of isolated vehicles was considered to be an ideal situation in which to

use the radar speedometer technique,

5) high AADT volumes with an average percentage of trucks represented an adequate sample.

Exit ramps;

1) deceleration ramps with excellent vertical and horizontal alignments, (upgrades of less than 2%),
2) high through traffic operating speeds, (legal speed limits on the mainline were 100 km/h),
3) excellent diverging conditions which eliminated any upstream restrictions,
4) no severe platooning effects were observed on the exit ramps and the abundance of exiting vehicles was considered to be ideal for monitoring vehicle deceleration speeds,
5) high AADT volumes on the mainline with a high percentage of trucks represented an adequate sample.

The location of entrance and exit terminals studied in this project are shown in Figure 6.1. Pertinent data for each acceleration and deceleration lane are given in Table 6.1.

6.1.2 FIELD APPLICATION /STUDY PROCEDURES

For the purposes of this study, the radar emitter/ receiver units were hidden within specially constructed guide posts.Figure 6.2 exhibits the guideposts which was

Table 6.1 STUDY LOCATION DATA, ACCELERATION AND DECELERATION LANES

SITE	LOCATION	DIRECTION OF RAMP	RAMP TYPE	GEOMETRIC CONDITION
1	HWY 14/50th ST.	EASTBOUND	ENTRANCE DIRECT TAPER	TANGENT
2	HWY 16/60	WESTBOUND	ENTRANCE DIRECT TAPER	TANGENT
3	HWY 14/17th ST.	WESTBOUND	ENTRANCE DIRECT TAPER	TANGENT
4	HWY 2/LEDUC	SOUTHBOUND	EXIT DIRECT TAPER	TANGENT
5	HWY 14/21	EASTBOUND	EXIT DIRECT TAPER	TANGENT
6	HWY 14/17th ST.	EASTBOUND	EXIT DIRECT TAPER	TANGENT

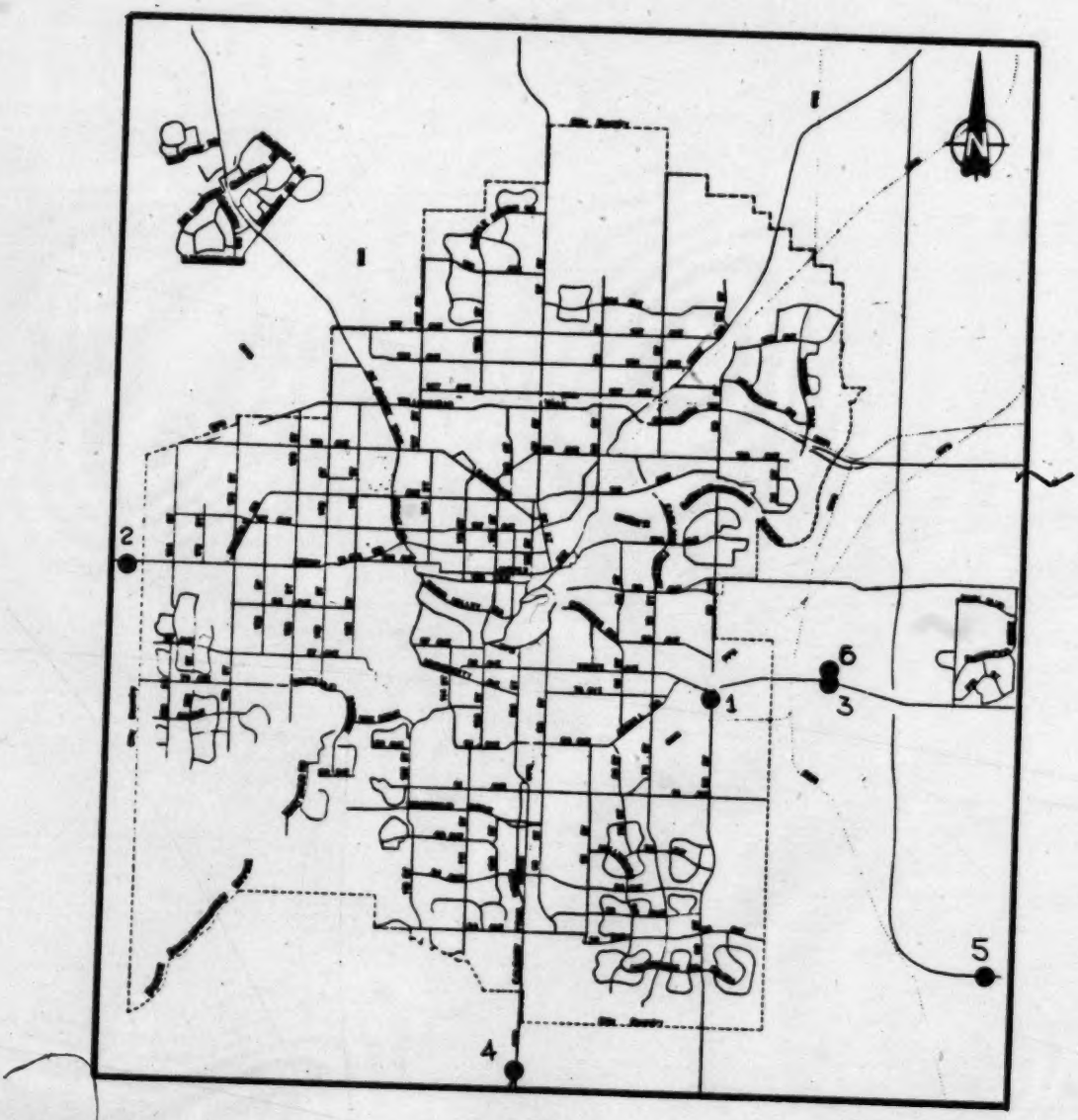


Figure 6.1 STUDY LOCATIONS OF ACCELERATION AND DECELERATION LANES

located at the shoulder of the ramp. The speed records of the monitored vehicles were noted inside parked vehicles. These vehicles were operated by the Department of Transportation Safety Branch were used since they allowed for ample interior room with the speed recorders mounted on the dash.

With the emitter / receivers located along the shoulder of the ramp, at key locations, and the observation vans parked away from the survey location, speed histories of individual vehicles were obtained as they either accelerated or decelerated on the ramp under observation.

6.1.3 STUDY PROCEDURES / DATA COLLECTION

A total of 742 vehicles were monitored at three separate entrance ramps and 384 at three separate exit ramps. The data was obtained during five morning observations. All mornings were sunny and clear. Two radar units were required to monitor the speeds of the ramp vehicles at each ramp location. Reference markers were placed along the shoulder of the ramps at specified distances with one of the reference markers being situated at the physical gore of the ramp. Figures 6.3 shows a typical reference configuration at an entrance ramp.

After suitably orienting the radar units, the emitter / receivers were checked to determine if they were operating properly. Once this check had been performed, the radar units were left on for the remainder of the data collection

Figure 6.2 RADAR SET-UP ALONG SHOULDER OF RAMP

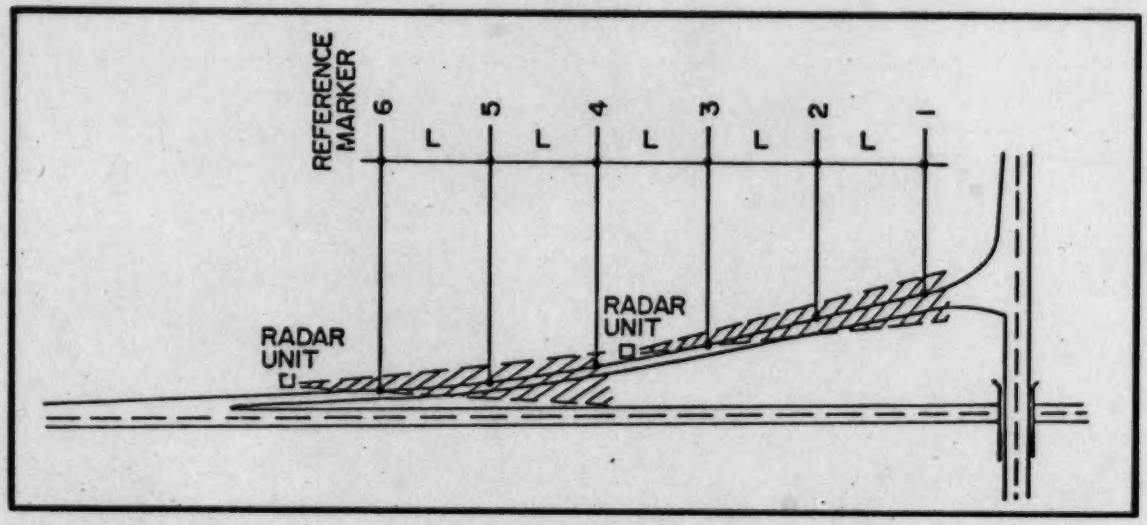


Figure 6.3 TYPICAL REFERENCE CONFIGURATIONS AT AN ENTRANCE RAMP

period. Vehicle speeds were recorded by the observers as each vehicle entered the radar cone and passed each of the reference markers. The recorded data was manually coded and processed through a computer program whose output was used in producing acceleration rates, deceleration rates and speed distance histories. The actual survey recorded both cars and light trucks which were considered as passenger cars. Single-axle and double axle trucks were also monitored during the field survey, although only passenger vehicle are discussed in this study.

The speeds of through vehicles were also studied at each interchange site around the point where the acceleration and deceleration lanes joined the through lanes. This was done to compare speeds of the acceleration and deceleration lane traffic with through lane traffic at each location.

6.1.4 DATA REDUCTION

It was decided that the collected data could best be handled if based on some predetermined criteria. Speed classes were used to condense the information. A typical field sheet for an entrance ramp site is illustrated in Figure 6.4. The manually coded data was processed through the computer program which assumed a normal distribution for the vehicle speeds. Figure 6.5 shows typical observed frequency distributions of speeds for accelerating vehicles at four consecutive reference markers along one of the

Speed Class	Speed Range	PASSENGER CARS AND HALF TONS			SEMIS AND STRAIGHTS		
		REF. LK. 1	REF. LK. 2	REF. LK. 3	REF. LK. 1	REF. LK. 2	REF. LK. 3
16	15.1-17						
18	17.1-19						
20	19.1-21						
22	21.1-23						
24	23.1-25						
26	25.1-27						
28	26.1-29						
30	29.1-31						
32	31.1-33				1		
34	33.1-35	2			1		
36	35.1-37				1		
38	37.1-39				1		
40	39.1-41	1				1	
42	41.1-43	1			4		
44	43.1-45	2			2	1	1
46	45.1-47	4	2	1	1	1	
48	47.1-49	8	1	1		1	
50	49.1-51	7	1		3	4	3
52	51.1-53	9	1			2	3
54	53.1-55	11	4	2		1	1
56	55.1-57	9	10	1		3	2
58	57.1-59	8	5	3		1	2
60	59.1-61	6	11	3			2
62	61.1-63	7	11	3			
64	63.1-65	6	11	5			
66	65.1-67	2	9	10			1
68	67.1-69	2	9	14			
70	69.1-71		1	4			
72	71.1-73			9			
74	73.1-75	1	4	10			
76	75.1-77	1	1	3			
78	77.1-79	1	2	1			
80	79.1-81	1		3			
82	81.1-83			3			
84	83.1-85			2			
86	85.1-87		1	1			
88	87.1-89						
90	89.1-91						
92	91.1-93						
94	93.1-95						
96	95.1-97			1			
98	97.1-99						
100	99.1-101						
102	100.1-103						
104	103.1-105						
106	105.1-107						
108	107.1-109						
110	109.1-111						
112	111.1-113						
114	113.1-115						
116	115.1-117						
118	117.1-119						
120	119.1-121						

Figure 6.4 TYPICAL FIELD DATA SHEET

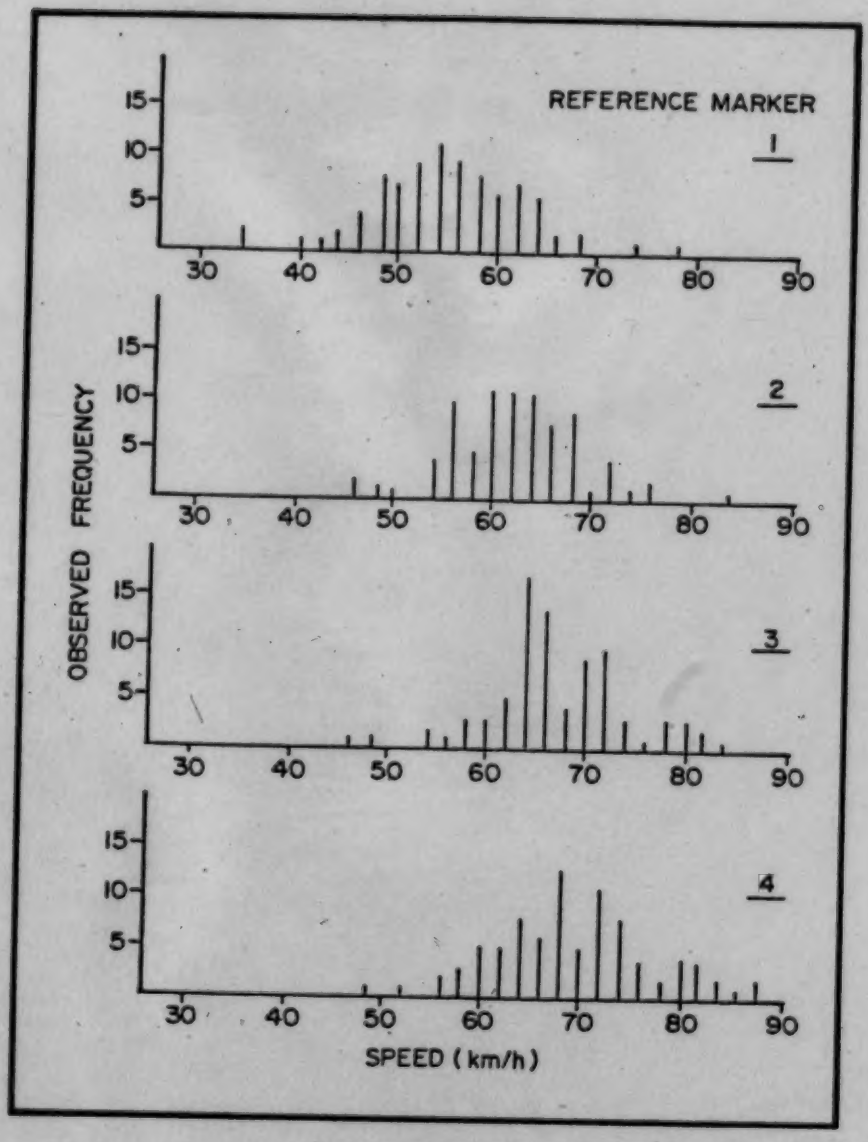


Figure 6.5 TYPICAL FREQUENCY DISTRIBUTIONS

entrance ramps studied.

The computer program generated the 85th, 50th, 15th, and the mean speeds for passenger cars (including half-tons) and trucks, as well as the combined speeds of these two groups. The computer output also included the 95% confidence limit on the mean, the standard deviation and plotted the cummulative percent frequency against speed. Figure 6.6 and 6.7 are typical printouts for one reference marker at an entrance ramp.

6.2 VEHICLE REGISTRATION TRENDS

6.2.1 DATA COLLECTION

In the last four or five years, an increasing number of small European cars and compact cars developed by American automobile companies have appeared on the roads in greater numbers(5, 10, 28, 37, 44). Figure 6.8. exhibits the registration of these smaller passenger vehicles in relation to the total number of vehicles registered in Canada. As can be seen from this Figure, the proportion of smaller cars being purchased is on the increase. This trend has reached the point where small and compact vehicles have gained their share of the automobile market.

6.2.2 DATA ANALYSIS

This trend in the purchase of smaller and more compact cars is in response to a change in consumer buying habits.

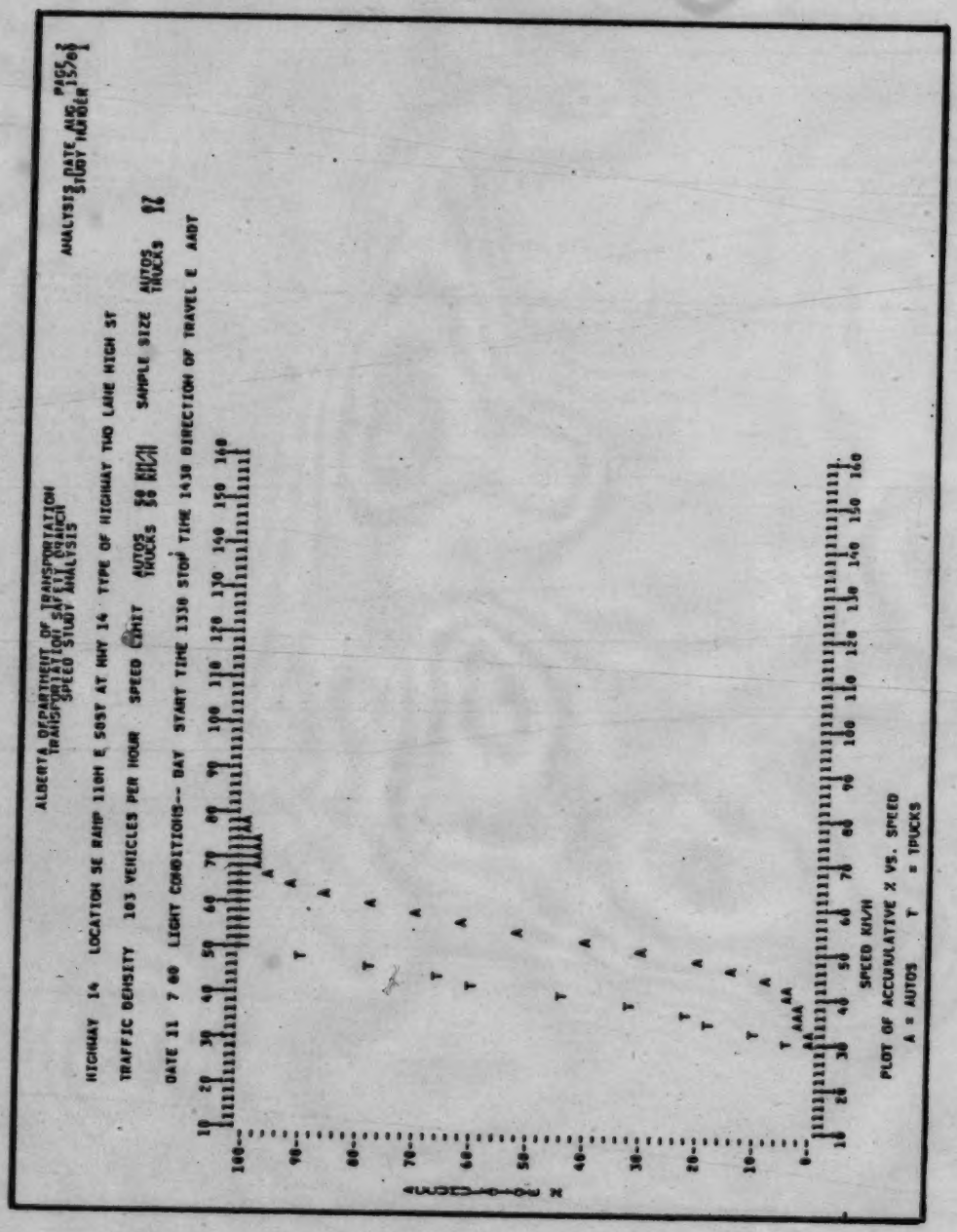
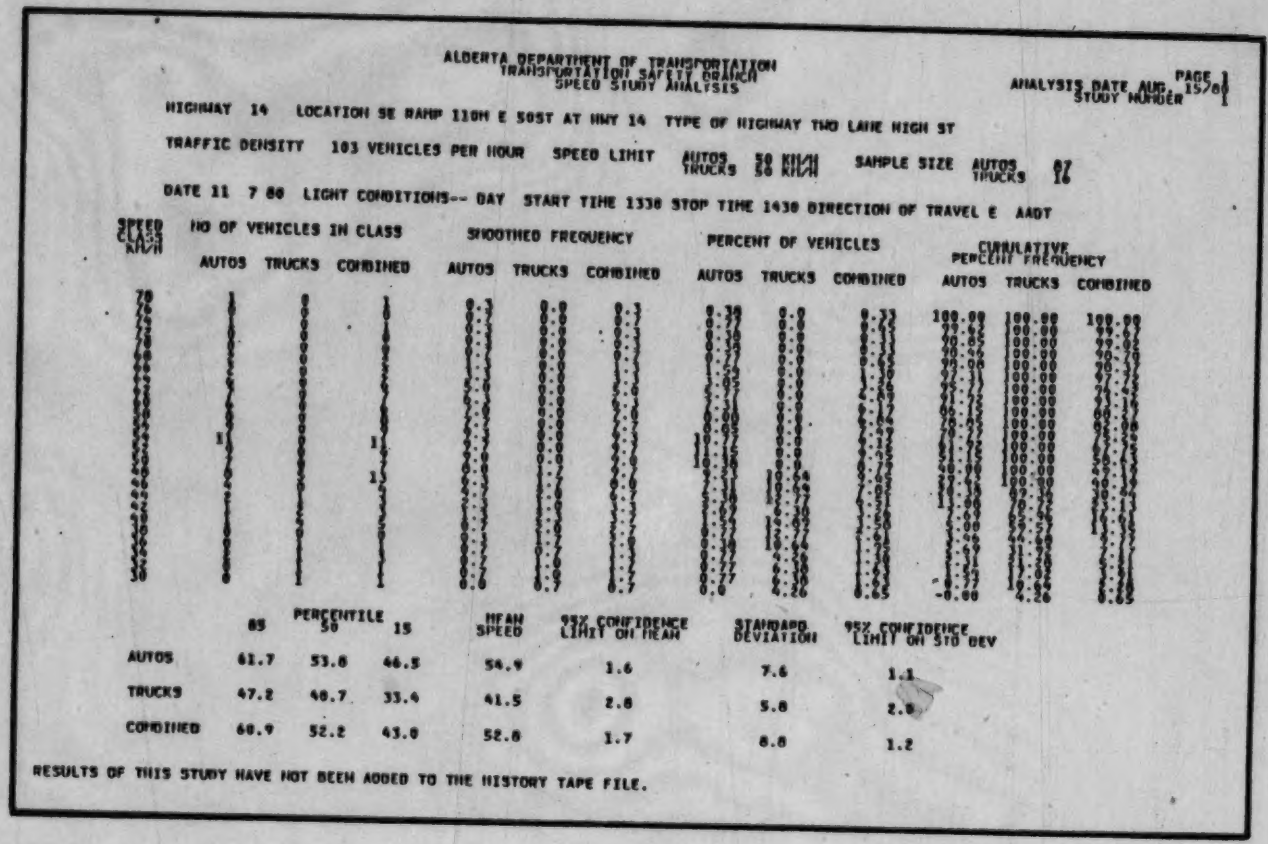

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS
ANALYSIS DATE AUG. 1976
STUDY NUMBER
HIGHWAY 14 LOCATION SE RAMP 11SH E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH SF
TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS KM/H SAMPLE SIZE AUTOS
TRUCKS %
DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT
PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS
SPEED KM/H

Figure 6.6 TYPICAL COMPUTER PRINTOUT



ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

PAGE 1
ANALYSIS DATE AUG. 15/86
STUDY NUMBER 1

HIGHWAY 14 LOCATION SE RAMP 110M E SOST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 87 TRUCKS 16

DATE 11 7 86 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
70	1	0	1	0.3	0.0	0.3	0.38	0.0	0.33	100.00	100.00	100.00
76	0	0	0	0.3	0.0	0.3	0.27	0.0	0.22	99.62	100.00	99.67
72	0	0	0	0.3	0.0	0.3	0.38	0.0	0.33	99.25	100.00	99.33
68	0	0	0	0.3	0.0	0.3	0.38	0.0	0.33	98.87	100.00	99.00
66	0	0	0	0.3	0.0	0.3	0.38	0.0	0.33	98.49	100.00	98.67
64	0	0	0	0.3	0.0	0.3	0.38	0.0	0.33	98.11	100.00	98.33
62	1	0	1	0.3	0.0	0.3	0.38	0.0	0.33	97.74	100.00	98.00
60	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	97.36	100.00	97.67
58	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	96.58	100.00	97.00
56	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	95.81	100.00	96.33
54	4	0	4	1.3	0.0	1.3	1.53	0.0	1.32	95.03	100.00	95.67
52	5	0	5	1.7	0.0	1.7	1.92	0.0	1.65	93.50	100.00	94.33
50	7	0	7	2.3	0.0	2.3	2.68	0.0	2.31	91.58	100.00	92.67
48	8	0	8	2.7	0.0	2.7	3.07	0.0	2.64	88.90	100.00	90.36
46	8	0	8	2.7	0.0	2.7	3.07	0.0	2.64	85.83	100.00	87.72
44	7	0	7	2.3	0.0	2.3	2.68	0.0	2.31	82.76	100.00	85.08
42	6	0	6	2.0	0.0	2.0	2.30	0.0	1.98	80.08	100.00	82.77
40	5	0	5	1.7	0.0	1.7	1.92	0.0	1.65	77.78	100.00	80.79
38	4	0	4	1.3	0.0	1.3	1.53	0.0	1.32	75.86	100.00	79.14
36	3	0	3	1.0	0.0	1.0	1.15	0.0	0.99	74.33	100.00	77.81
34	3	0	3	1.0	0.0	1.0	1.15	0.0	0.99	73.18	100.00	76.82
32	3	0	3	1.0	0.0	1.0	1.15	0.0	0.99	72.03	100.00	75.83
30	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	70.88	100.00	74.84
28	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	70.11	100.00	74.17
26	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	69.34	100.00	73.51
24	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	68.57	100.00	72.85
22	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	67.80	100.00	72.19
20	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	67.03	100.00	71.52
18	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	66.26	100.00	70.86
16	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	65.49	100.00	70.20
14	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	64.72	100.00	69.54
12	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	63.95	100.00	68.87
10	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	63.18	100.00	68.21
8	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	62.41	100.00	67.55
6	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	61.64	100.00	66.89
4	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	60.87	100.00	66.23
2	2	0	2	0.7	0.0	0.7	0.77	0.0	0.66	60.10	100.00	65.56
0	0	1	1	0.0	0.7	0.7	0.0	6.26	0.65	-0.00	4.26	0.65

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	61.7	53.6	46.5	54.9	1.6	7.6	1.1
TRUCKS	47.2	40.7	33.4	41.5	2.8	5.8	2.8
COMBINED	60.9	52.2	43.0	52.8	1.7	8.8	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

Figure 6.7 TYPICAL COMPUTER PRINTOUT

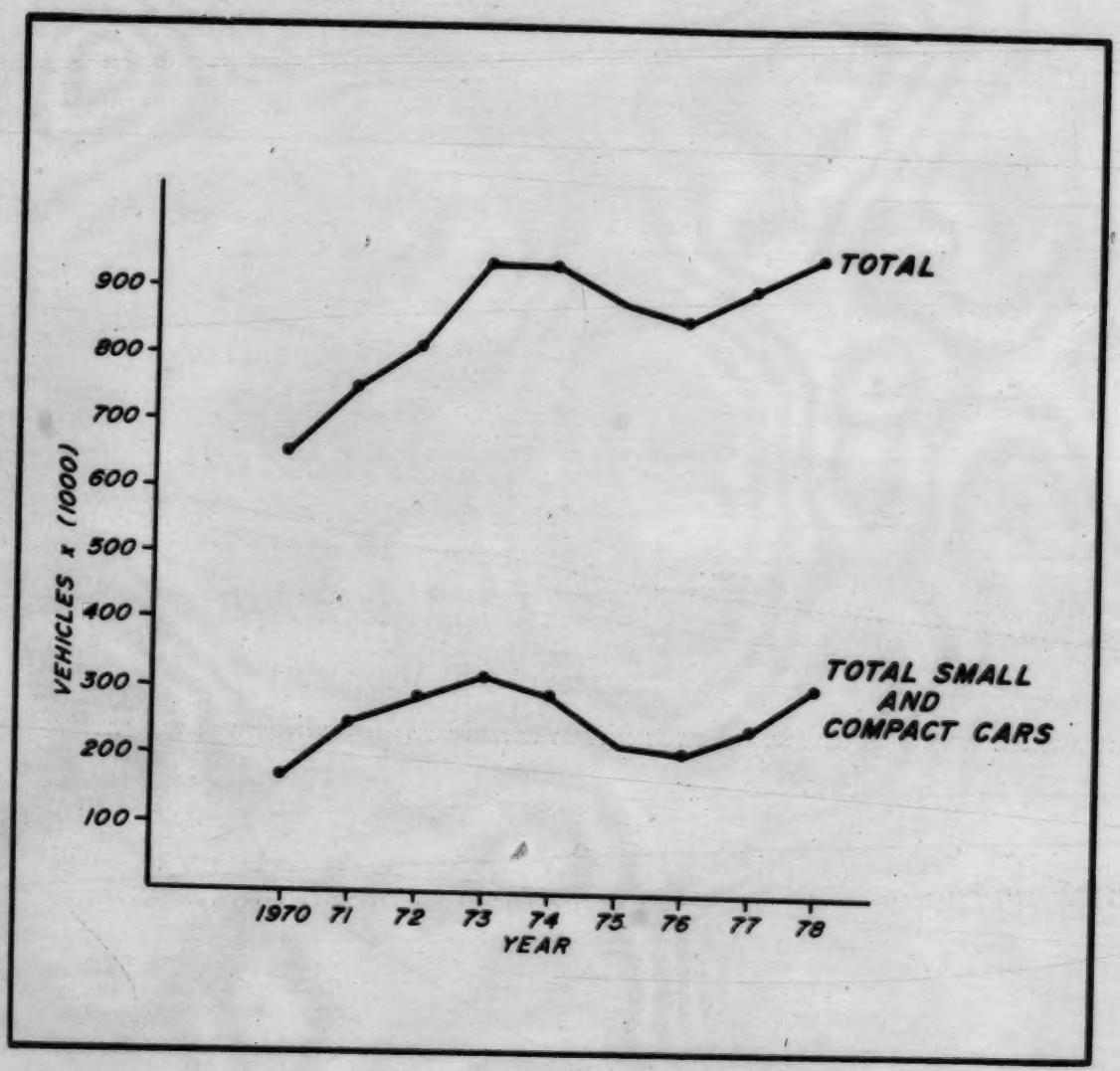


Figure 6.8 VEHICLE REGISTRATION TRENDS

Vehicle purchasers, are on the average, seeking more fuel-conserving cars(13, 30, 38). In response to this demand, the automobile industry is gradually changing its vehicle fleet mix to produce passenger cars with better fuel consumption characteristics(38, 39). This is being accomplished primarily through size and weight reduction, as well as a shift to smaller engines with concomitant performance impacts.

The most important determinant of acceleration performance capabiity is the horsepower-to-weight ratio(45) (Other characteristics which also have an influence on acceleration capability are the transmission and axle ratio, frontal area, and the aerodynamic drag coefficient). Future vehicle characteristic trends reveal that there will be a decrease in the number of moderate and high performance vehicles, with relatively little increase in the number of passenger vehicles having poor acceleration capabilities. Trends indicate that changes in passenger vehicle acceleration rates have already occurred and are not expected to deviate appreciably in the future. In other words, the spread on vehicle performance will become less in the future years, leading to a more homogeneous mix of passenger vehicles.

The previous trends are somewhat conservative regarding vehicle acceleration performance. They do not assume a significant market impact of anything but gasoline powered engines. There is however, an anticipation of a market

change in vehicle power - plants including, diesels, electric vehicles, and hybrid vehicles. The introduction of these types of vehicles will further reduce the average performance of automobiles. If this were to occur vehicles would be replaced by ones of lower performance, but probably not lower than many present day vehicles.

7. ANALYSIS AND EVALUATION

7.1 OBSERVED RAMP AND HIGHWAY SPEEDS

The observed speeds monitored on the ramp controlling curves of the entrance and exit ramps studied and the observed highway speeds in the immediate vicinity of the entrance ramp terminals are shown in Table 7.1.

As is shown in Table 7.1, 85 percent or more of the vehicles monitored were travelling at speeds which were fairly close to the design speeds of the ramp controlling curves. Fifty percent or more of the passenger cars observed were travelling at approximately the average running speed of the ramp controlling curve.

The observed highway speeds found in the vicinity of the entrance and exit ramps were monitored at a different time than the ramp vehicle speeds. However, these speeds are representative of the vehicle speeds found in the proximity of the survey sites and, as such, have been shown in the same table.

Eighty-five percent or more of the highway vehicles monitored were travelling at approximately the average running speed of the highway while 50 percent or more of the passenger vehicles observed were travelling below the average running speed of the highway.

From these observed values the following deductions can be made:

1) Based on the surveys, ramp vehicle speeds are

Table 7.1 OBSERVED RAMP AND HIGHWAYS SPEEDS

SITE	RAMP DESIGN SPEED (km/h)	OBSERVED RAMP SPEEDS (km/h)		HWY DESIGN SPEED km/h	OBSERVED HWY SPEEDS (km/h)	
		85th	50th		85th	50th
2	70	73.5 66.4	65.7 60.2	110	112	101
3	80	80.3 70.2	71.3 59.9	120	103	95
4	80	91.4 81.5	80.1 68.0	120	109	99
5	80	80.3 71.0	71.7 62.4	120	112	101
6	70	72.1 65.2	62.8 56.2	110	102	94

increasing. A minimal difference exists between the average running speed of the vehicles and the design speeds for the ramp controlling curves. These findings are in agreement with those of RTAC but not with AASHO (Table 2.1)

2) Based on the Highway speed studies, although vehicle speeds have increased, passenger cars still tend to travel at the average running speed of the facility. In this case, these findings are in agreement with both RTAC and AASHO (Table 2.1).

3) Speeds recommended in RTAC manual more accurately reflect speeds on controlling ramp curve. Both RTAC and AASHO are representative of average running speeds on highways. By analyzing these findings with respect to the design of entrance and exit terminals, the following conclusions can be reached.

Acceleration lanes:

1) Minimum acceleration lengths should be based on vehicles accelerating from the average speed of the ramp controlling curve to 8 km/h less than the average running speed of the through highway.

2) Desirable acceleration lengths should be based on vehicles accelerating from the design speed of the ramp controlling curve to 8 km/h less

than the design speed of the through highway.

Deceleration lanes:

1) Minimum deceleration lengths should be based on vehicles decelerating from the average running speeds of the through highway to the design speed of the ramp controlling curve.
2) Desirable deceleration lengths should be based on vehicles decelerating from the average running speed of the through highway to the average running speed of the ramp controlling curve.

7.2 ACCELERATION

7.2.1 ACCELERATION PERFORMANCE CHARACTERISTICS

Three hundred and seventy nine vehicles were monitored at three entrance ramp locations. With the data obtained from the computer program, speed distance curves were plotted for each on-ramp location surveyed. Figure 7.1 illustrates a typical speed-distance history curve for one of the entrance ramps. As illustrated, some scatter of the data was observed. A regression analysis was performed on the observed ramp speeds. A correlation coefficient of 0.91 was computed and as a result, the scatter in the data was considered to be within reasonable limits and therefore acceptable. Deviations of the data from the speed distance curve can be explained by driver behaviour, vehicle performance capabilities and the interactions between the

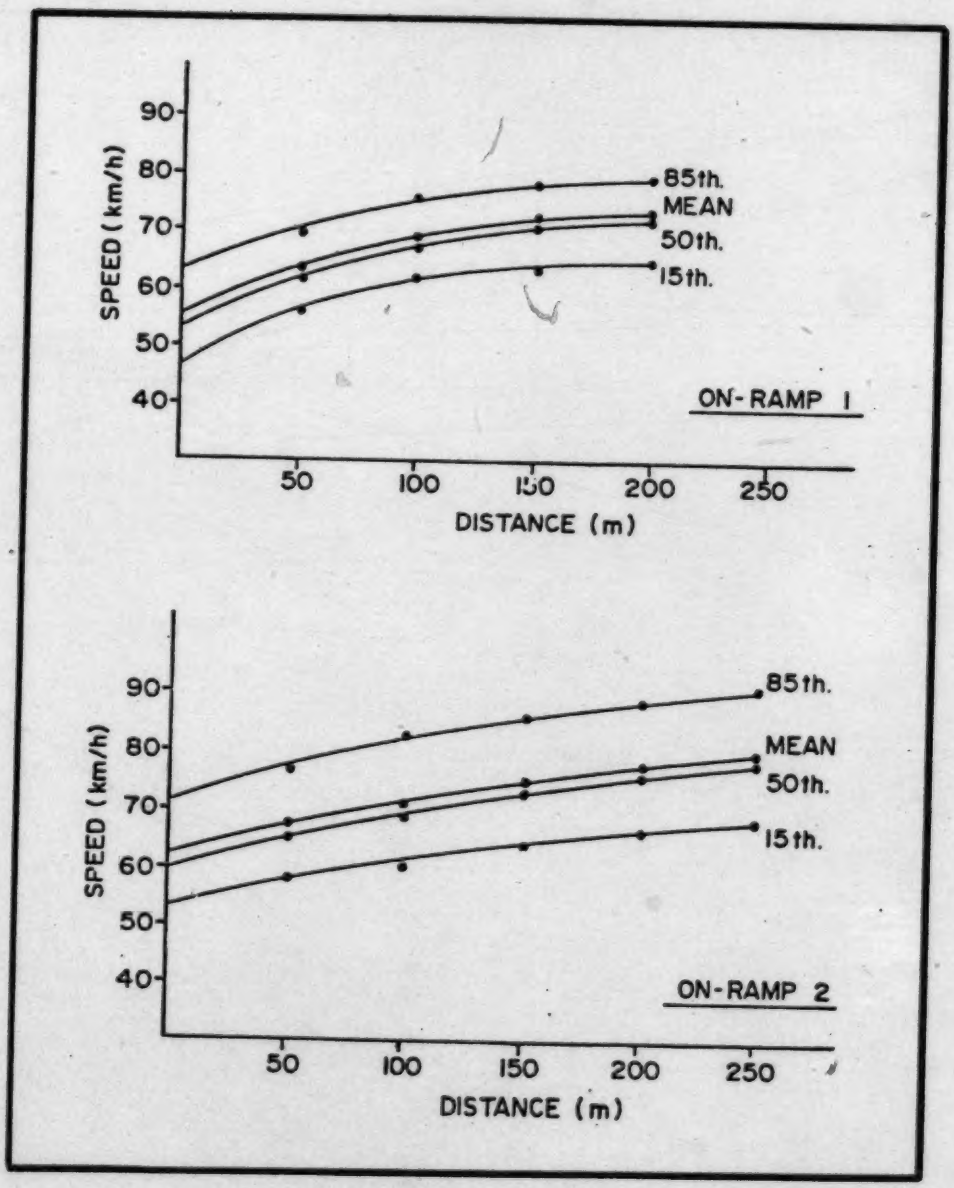


Figure 7.1 OBSERVED SPEED-DISTANCE HISTORY

two.

From the speed-distance plots, the acceleration rates were determined. For the purpose of this study, average acceleration rates were generated from the mean speeds as calculated by the computer program for all the entrance ramps under observation.

The mathematical relationship which was utilized to calculate the acceleration rates is illustrated below:

$$\frac{v_f^2 - v_o^2}{2l} = a$$

Where:

v_f = final velocity in metres per second

v_o = initial velocity in metres per second

l = distance in metres

a = acceleration rate in metres per second per second

Conversion of acceleration rate from metres per second per second to kilometres per hour per second was achieved through the use of the formula:

$$A = a/3.6$$

Where: A = acceleration rate in kilometres per hour per second.

Typical acceleration rates for an entrance ramp are shown in Table 7.2.

A regression analysis was performed on the acceleration rates collected at the observed entrance ramp locations. An exponential relationship was assumed as it best described the relationship between speed and acceleration rates between 30 km/h and 70 km/h. Only acceleration rates between these two speeds were analyzed as the effect of the posted speed limit on vehicle speed was quite noticable during the field survey. This observation is supported by the lower acceleration rates found at higher speeds. Most manoeuvres of interest occurred between these speeds, and as such, it was felt that they would be representative of normal passenger acceleration rates.

The equation took the form:

$$y = 159.91e^{-0.44x}$$

Prior to using this exponential relationship, some effort was devoted to examining relationships with alternative forms. In particular, a linear form $y = ax + b$ was considered. Analytical and numerical experimental with this form indicated that it did not provide significant improvements over the exponential form as the coefficient of

Table 7.2 TYPICAL ACCELERATION RATES OBSERVED AT AN ENTRANCE RAMP

	DISTANCE (m)	MEAN SPEED (km/h)	A (km/h/s)
SITE 1	40.0	54.9	2.93
SITE 2	40.0	62.1	2.38
SITE 3	40.0	67.4	1.01
SITE 4	40.0	69.5	1.18
SITE 5	40.0	71.9	0.66
SITE 6		73.2	

correlation using the linear regression analysis was computed as 0.78.

Using the exponential regression analysis, calculated acceleration rates for passenger vehicles between 30 km/h and 80 km/h are exhibited in Figure 7.2.

7.2.2 COMPARISON WITH EXISTING DESIGN CURVES

The acceleration rates obtained from this study were compared to both the AASHO and Matson acceleration curves as illustrated on Figure 7.3. This comparison demonstrated that the radar speedometer technique used generated data which was directly comparable to these two design curves. From this it can be concluded that the use of the radar speedometer technique to obtain vehicle acceleration and deceleration rates is valid. Thus one of the primary objectives of this study has been met.

Further useful results can be obtained by analyzing the acceleration data with respect to both the AASHO and Matson acceleration curves. As illustrated in Figure 7.3, the acceleration curve generated from the vehicle performance survey has the same basic shape as both the AASHO and Matson acceleration curves.

The location of the lower portion of the study curve relative to the AASHO curve indicates that vehicle acceleration rates between 20 km/h and 70 km/h have increased and as such, shorter acceleration distances are required in order to accelerate between two sets of

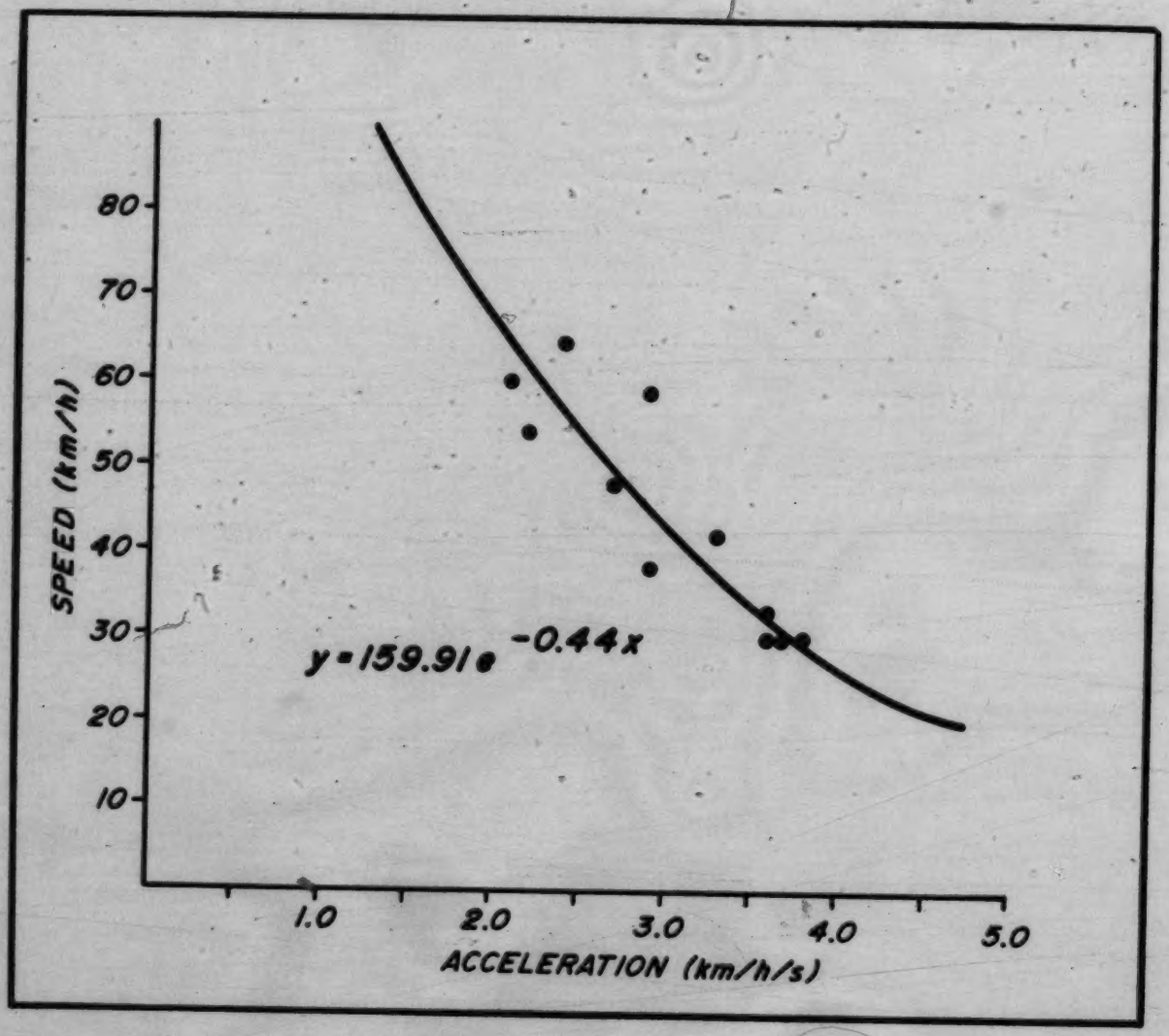


Figure 7.2 TYPICAL ACCELERATION RATES FOR PASSENGER VEHICLES

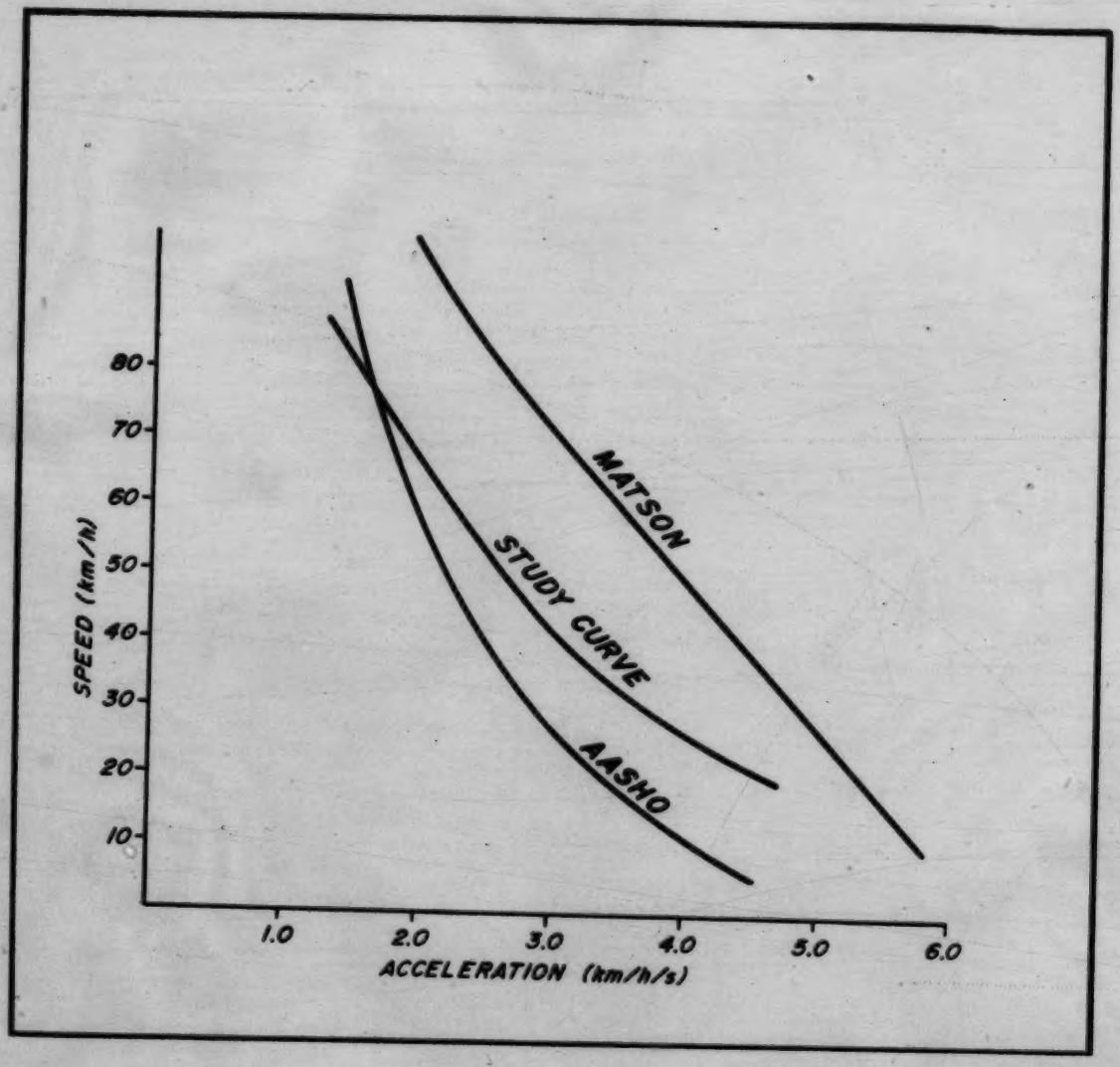


Figure 7.3 COMPARISON OF STUDY CURVE WITH BOTH THE AASHO & MATSON ACCELERATION CURVES

identical speeds. As the speeds increase, the acceleration rates derived from this study are quite similar to those suggested by the ASSHO acceleration curve.

With respect to the Matson acceleration curve, the study curve continuously falls to the left of the curve. This infers that the acceleration rates derived from the vehicle performance survey are lower than those proposed by the Matson curve.

7.3 DECELERATION

7.3.1 DECELERATION PERFORMANCE CHARACTERISTICS

Of the three exit ramps surveyed during the field testing, only one exit ramp exhibited characteristics of noticable vehicle deceleration. This was due to the fact that the remaining three exit ramps were constructed to high design standards and there was no stop condition at the ends of the exit terminals. These two exit terminals led either to directional ramps or to outer ramp connectors and consequently high ramp speeds were noticed. Due to this condition, vehicles exiting from the main facility were not required to decelerate appreciably.

One hundred and thiry four vehicles were monitored at the third exit ramp. It was this ramp that exhibited vehicle deceleration characteristics. As in the case of the entrance ramps, speed-distance curves were plotted and have been illustrated in Figure 7.4. From the speed-distance curves,

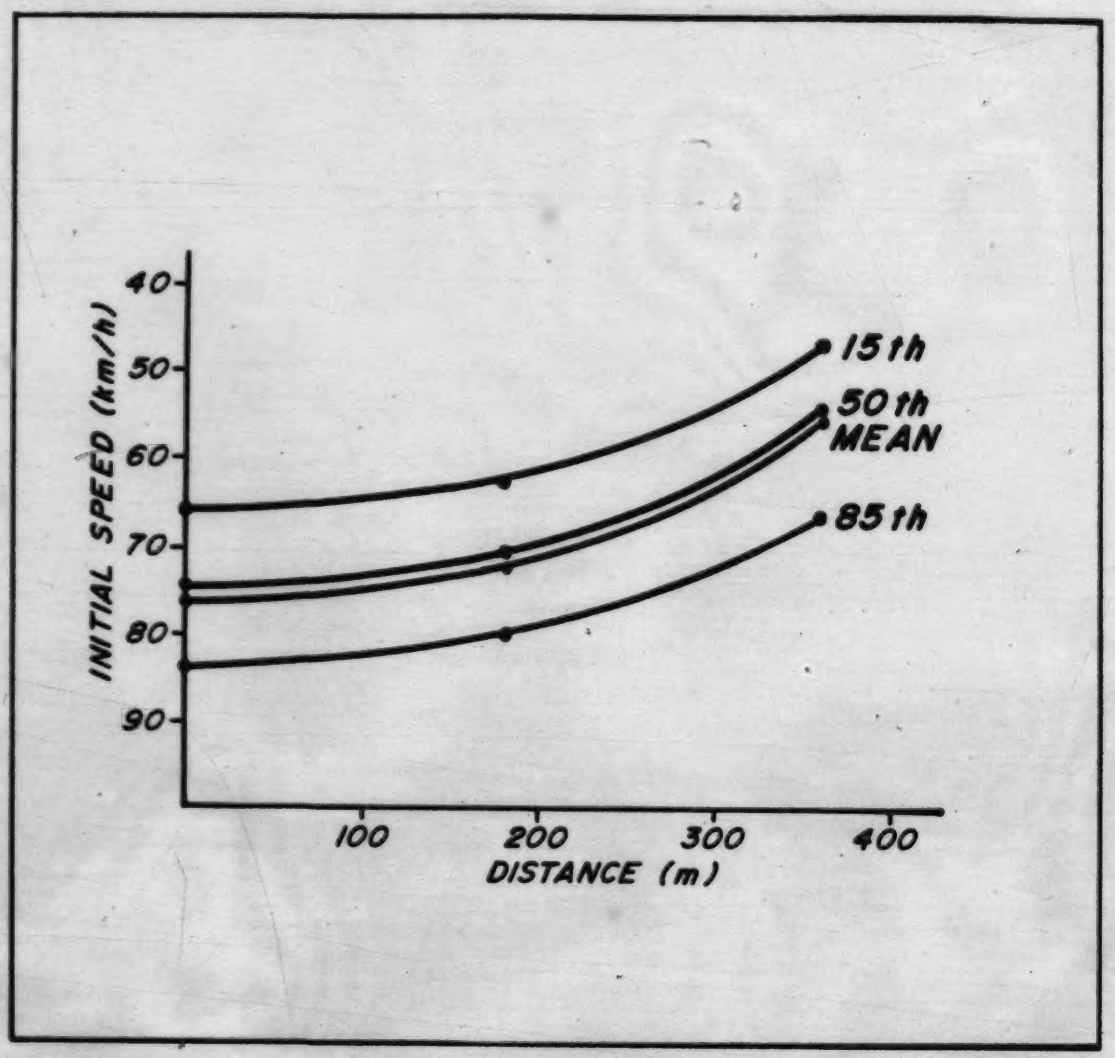


Figure 7.4 DECELERATION SPEED-DISTANCE CURVES

deceleration rates were determined. For the purpose of this study average deceleration rates were generated from the mean speeds as calculated from the computer output.

The mathematical relationship which was utilized to calculate the deceleration rates is shown below:

$$\frac{v_o^2 - v_f}{2a} = l$$

Conversion of deceleration rate from metres per second per second to kilometres per hour per second was achieved through the use of the formula:

$$D = 0.2778d$$

Where: D = deceleration rate in kilometres per hour per second:

v_o = initial velocity in metres per second

v_f = final velocity in metres per second

l = distance in metres

d = deceleration rate in metres per second per second

Typical deceleration rates for the exit ramp are shown in Table 7.3.

Table 7.3 DECELERATION RATES OBSERVED AT AN EXIT RAMP

REFERENCE MARKER	DISTANCE (m)	MEAN SPEED (km/h)	D (km/h/s)
1		76.2	
	180 m		0.38
2		72.9	
1		77.7	
	180 m		1.52
2		63.8	

D = Deceleration Rate

7.3.2 COMPARISON WITH EXISTING DESIGN CURVES

For the purpose of this first portion of analysis it was assumed that existing vehicles decelerated in gear without the use of brakes from the time they left the mainline until reaching the painted wedge of the exit terminal.

Eighty five percent of the passenger vehicles monitored reduced their speed from 112 km/h to 85 km/h over a length of 290m which is the length of taper provided at the exit terminal. Similarly, fifty percent or more vehicles reduced their speed from 101 km/h to 76 km/h over the same length. These observed values are plotted on Figure 7.5. As is shown in Figure 7.5, recommended lengths of deceleration tapers for reductions in speed from 112 km/h and 101 km/h to 85 km/h and 76 km/h are in the order of 200m and 180m respectively.

Once the vehicles reached the painted wedge of the exit terminal, it was assumed that the vehicles decelerated with the use of brakes until reaching the ramp controlling curve. Eighty five percent of more of the vehicles reduced their speed from 85 km/h to 75 km/h over a distance of 120m, the distance between the painted wedge to the beginning of the controlling curve. Fifty percent or more of the passenger vehicles monitored reduced their speeds from 77 km/h to 68 km/h over the same length. These observed values are plotted on Figure 7.6. For the same distances in speed, Figure 7.6 recommends that minimum distances of 60m and 55m be provided

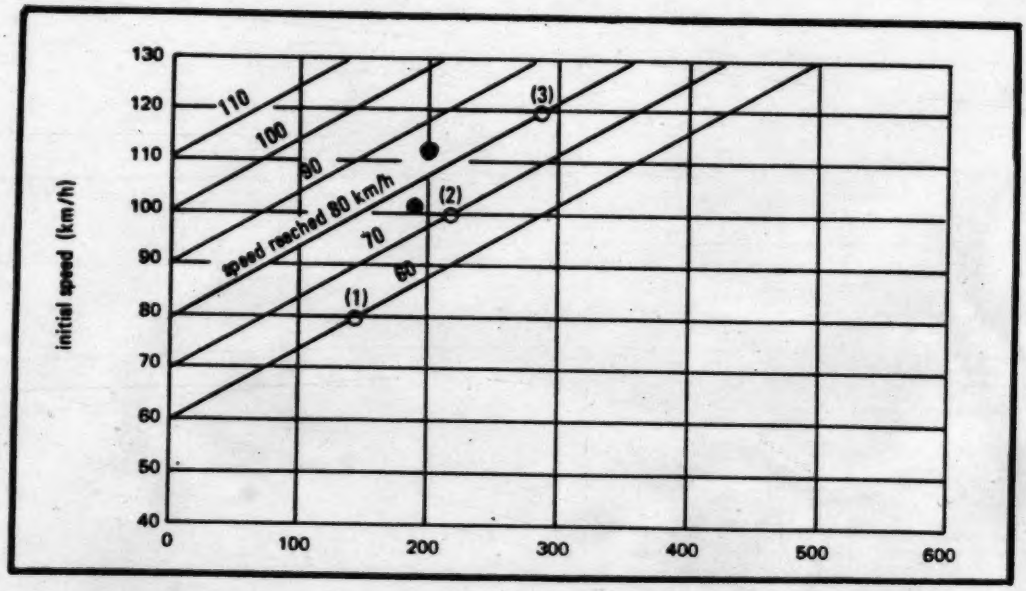


Figure 7.5 OBSERVED DECELERATION IN GEAR

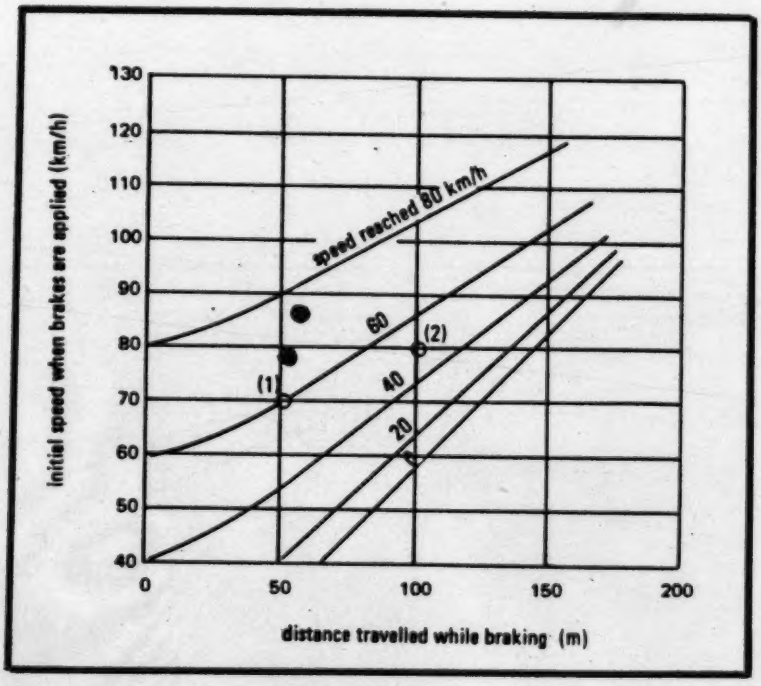


Figure 7.6 OBSERVED DECELERATION WITH THE USE OF BRAKES

respectively.

7.4 EVALUATION OF RESULTS

7.4.1 VEHICLE ACCELERATION PERFORMANCE

Results of the vehicle acceleration performance survey have a number of underlying implications.

First, they reflect the improvement in vehicle operating characteristics that have occurred over the past few years. This concurs with the findings of the vehicle registration trends. Trends for the future reveal that average weights, engine size and horsepower will decline slowly but the horsepower to weight ratio will not change appreciably. This implies, that although fuel comsumption characteristics will continue to improve, little change in vehicle performance is expected. Increased acceleration rates derived from the vehicle survey can be attributed to the improved operating characteristics of the existing vehicle population and as previously stated are not expected to change drastically over the next few years.

As mentioned previously when discussing various entrance ramp terminal design standards, Canadian design standards use the criteria put forth in the American Association of State Highway Officials manual as the basis for their designs. Therefore this study has shown that normal acceleration rates for passenger vehicles as described by both AASHO and the Canadian standards are not

sensitive to the operating characteristics of todays vehicle population at the lower speed ranges.

In the light of these findings, this study proposes that a new acceleration curve be investigated. One which reflects the acceleration performance capability of todays passenger cars.

The acceleration curve illustrated in Figure 7.3 is suggested as an example of a new acceleration design curve. This curve is based upon the results of this study and is felt to be representative of the normal acceleration performance capability of passenger cars. This acceleration curve has been converted to a more directly usable form in Figure 7.6, showing distance travelled while accelerating between speeds.

In order to put this proposed acceleration design curve into perspective, Table 7.5 exhibits minimum and desirable acceleration lane lengths using the new acceleration curve as the basis for development. These minimum and desirable lengths of acceleration lanes developed are based upon the assumptions previously stated in Section 7.1, those being; minimum acceleration lengths are based on the length required to accelerate from the average running speed of the ramp controlling curve to 8 km/h less than the average running speed of the through highway traffic; desirable acceleration lengths are based upon the length required to accelerate from the design speed of the ramp controlling curve to 8 km/h less than the average running speed of the

Table 7.4 ACCELERATION LENGTHS -STUDY CURVE

HIGHWAY DESIGN SPEED (km/h)	8 km than avg. r.s. (km/h)	RAMP DESIGN SPEED (km/h) 20	30	40	50	60	70
		AVERAGE RUNNING SPEED (km/h) 20	30	40	50	60	70
50	42	52	37	8			
60	52	95	80	55	15		
70	62	150	140	120	80	18	
80	72	230	220	200	165	105	20

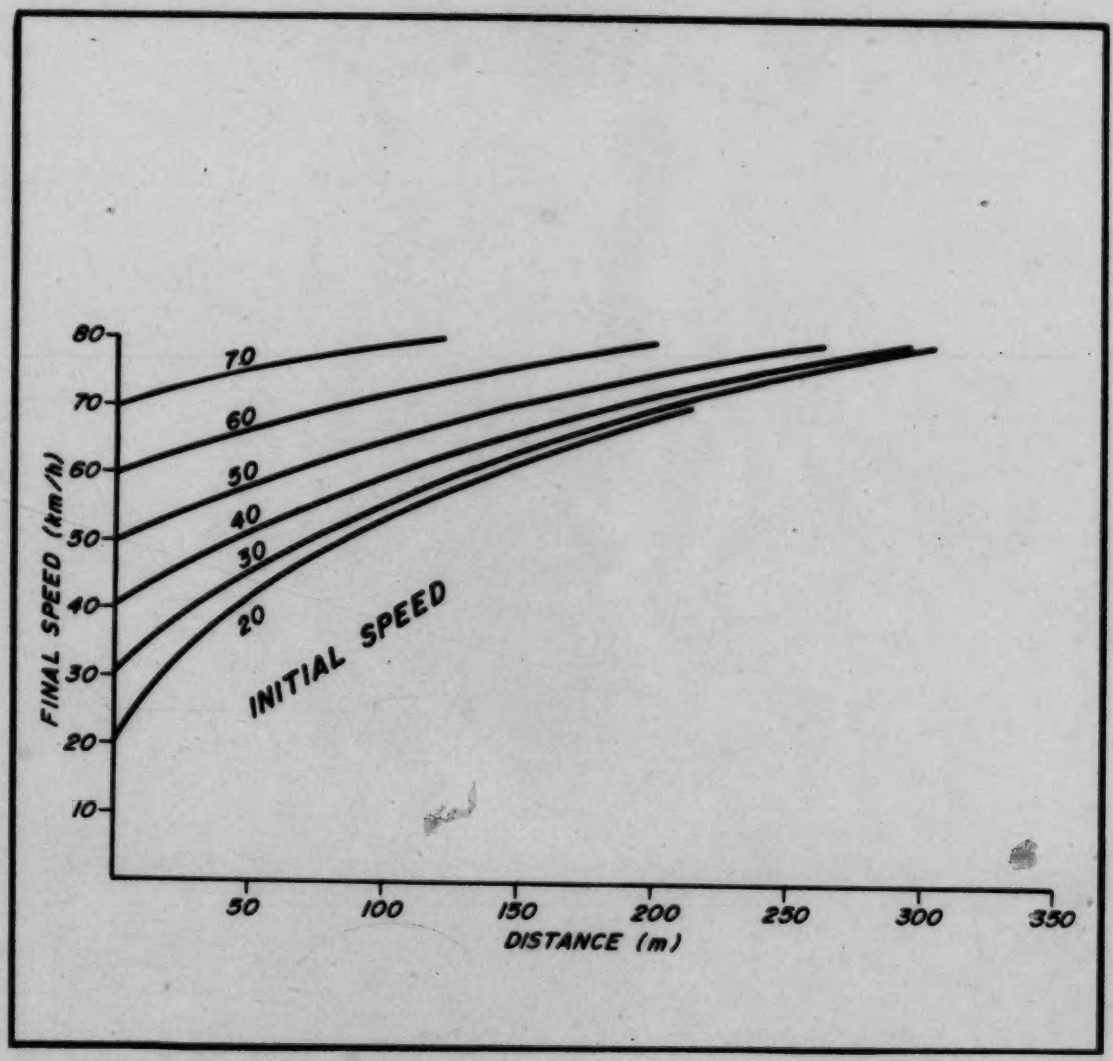


Figure 7.7 DISTANCE TRAVELLED WHILE ACCELERATING - STUDY CURVE

mainline traffic.

A comparison between the minimum and desirable acceleration lane lengths derived utilizing the proposed acceleration curve and those acceleration lengths developed in the Urban Highway Design Guide are illustrated in Table 7.6. Lengths derived from the AASHO speed-distance curve using the same basic assumptions are also shown in Table 7.6. As can be seen from Table 7.6 the minimum lengths of acceleration lanes developed from the proposed curve are lower than those derived from the AASHO speed-distance curves but not as short as the lengths developed in the UHDG. This is because minimum lengths of acceleration lanes developed in the UHDG are based upon the distance required to accelerate from the average running speed of the ramp controlling curve to 10 km/h less than the average running speed of the mainline.

The desirable lengths of acceleration lanes, determined from the study speed-distance curve, are shorter than those developed in the UHDG or AASHO for the lower speed ranges. As the speeds increase, all three lengths begin to approximate each other. This is due to the study curve being quite similar to the AASHO curve at the higher speed ranges.

The effect of increased acceleration capability might also be seen in several areas of traffic operation. It is possible to use increased acceleration performance capability in; weaving manoeuvres, to shorten the lane - changing time distance, and in the design of passing lanes.

Table 7.5 ACCELERATION LENGTHS-STUDY CURVE, UHDG, AASHO

HWY. DESIGN SPEED (km/h)				RAMP DESIGN SPEED (km/h)											
				30			40			50			60		
	S.C.[1]	UHDG[2] 20	AASHO[3]	S.C.	UHDG	AASHO	S.C.	UHDG	AASHO	S.C.	UHDG	AASHO	S.C.	UHDG	AASHO
50	32	70 105	68	37		45	8		10						
60	95	170 105	125	80	60 90	100	55	55 50	70	15	45	15			
70	150	125 185	200	140	115 165	180	120	90 115	140	80	65 70	90	18	50 100	20
80	230	195 285	300	200	180 265	280	200	150 215	240	165	125 165	190	105	50 100	120

1 S.C. - STUDY CURVE
2 UHDG 70 Minimum
105 DESIRABLE
3 AASHO - AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

Increased acceleration will also affect the rate of departure of vehicles stopped in queue at a traffic signal.

7.4.2 VEHICLE DECELERATION PERFORMANCE

Results of the passenger deceleration performance survey illustrate that existing design standards for deceleration lanes provide adequate lengths for existing vehicles. This conclusion illustrates that although acceleration performance capabilities have improved, deceleration performance capabilities of vehicles has not changed appreciably.

It is of interest to note the speed reduction which occurred from the time the exiting vehicles left the through highway until they reached the controlling ramp curve. For the exit ramp under consideration, 85 percent or more vehicles reduced their speed from 112 km/h (the average running speed of the highway) to approximately 85 km/h . This means that a 24 percent reduction in speed had occurred. Fifty percent or more vehicles reduced their speed from 101 km/h to 76 km/h indicating a speed reduction of 25 percent.

Based on the findings of this analysis the criteria for the design of deceleration lanes recommended by AASHO continues to be relevant. That is, vehicles decelerate in gear for approximately three seconds upon leaving the mainline facility and then decelerate with the use of brakes until reaching the controlling ramp curve on the exit ramp.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 METHODS OF EVALUATION

8.1.1 ALTERNATIVE METHOD OF DATA COLLECTION

The car following technique was initially attempted as a method of collecting data as it requires minimum personnel and equipment. As well, there would be no observers or unusual equipment along the road and thus most drivers would be unaware that they were being observed. Preliminary tests were performed in the field using this method but the results were found to be inconsistent and thus unusuable.

8.1.2 THE RADAR SPEEDOMETER TECHNIQUE AND SITE SELECTION

The radar speedometer used in this study system exhibited some clear advantages over the previously discussed method. It proved to be a reliable, portable system well suited to use in the field. While it was simple to operate, it provided accurate data. An effective computer program utilizing the coded data produced usable results.

Nevertheless, the major fault of the system was in its inability to isolate particular vehicles in a traffic situation and as a result some recorded data had to be rejected. This led to inefficiencies in the data collection system, since additional data had to be recorded to allow for those which had to be rejected. More importantly, this drawback curtailed the choice of observation locations. By applying the criteria listed previously, the choice of

suitable sites for any further investigations using a radar speedometer system would be faced with the same difficulties as described in this report. This means that at many sites of interest, where volumes are high, large amount of data would need to be recorded.

The magnitudes and variation of recorded data would appear to be partly a function of ramp alignment and other factors that pertain to a select site. No attempt was made in this study to consider the effect of these parameters since a study of this nature is outside the scope of this project. These factors should be considered in any future detailed studies concerned with the acceleration and deceleration performance of vehicles.

8.1.3 DATA COLLECTION

Ideally, a target vehicle should travel along the longitudinal axis of the radar beam. Any deviations from this path would result in a speed error proportional to the cosine of the angle between the vehicle trajectory and the beam axis. It was estimated that the maximum such angle encountered was in the order of 2 to 3 degrees. Thus any resulting errors in this study were considered to be negligible. Two operators were required at each study location - one to cover the first section of the ramp, the second to observe the speeds on the remainder of the acceleration or deceleration ramp. This method of data collection and the information derived from this could be

improved by modifying the speedometer electronically so that it produces a voltage output that is directly proportional to the target vehicle velocity. By feeding this signal into a portable strip chart recorder, a continous plot of a target vehicle velocity/time history could be obtained. Another method of data that could be attempted is the use of loop detectors in the roadway.

8.1.4 DATA ANALYSIS

The acceleration speed/distance curves plotted in Figure 7.1 demonstrate the range of observed performance while vehicles remained within the radar cone and no other vehicles moved into the beam to distort the output. It was found that the speed/distance graphs had a steep slope initially indicating high acceleration rates, but the slopes decreased as distance increased indicating that at higher speeds, the rates of acceleration decreased. (The effect of the posted speed limits and the realization that vehicles were not at full throttle acceleration condtions affected the shape of the graphs.) Where observed performance deviated in these speed/distance histories, the deviations were sufficiently small to be neglected.

8.2 SUMMARY OF PERTINENT FINDINGS

DIRECT TAPER vs PARALLEL LANES

The countries reviewed in the survey of ramp geometric design standards use two distinct design standards for entrance and exit terminals; direct taper designs and parallel lane designs. The direct taper design is predominantly used in Canada, Britain and the Untied States. The Dutch maintain the use of parallel lane designs for uniformity reasons.

Direct taper and parallel lane design ramp terminals operate quite differently and there are distinct advantages and disadvantages associated with each design. Nevertheless, both designs are functional provided the standards are properly adhered to and drivers are familiar with their operation.

The use of the taper design is favored and recommended on high speed facilities for the following reasons:

1) Studies of driver behaviour over the past few years indicate that the direct taper fits and conforms to the majority of drivers. There is also evidence that there is more efficiency of

operation and utilization of terminal areas.

2) The majority of highway agencies have converted to the direct taper design from the parallel form.

3) Improved aesthetics are inherent in the direct taper design.

The parallel design is recommended for use in the following special cases:

1) Low speed minor roads where economy of structures are of importance.

2) To add lanes on a highway for maintaining a given level of service or where a large percentage of trucks are prevalent and an added lane is needed for balance.

European standards for lengths of acceleration and deceleration were found to be generally lower than either the Canadian or American standards. This may be attributed to the fact that in European countries, vehicle characteristics and driver behaviour are more stringent and often higher standards are not attainable due to the right-of-way and construction costs.

COMPARISON OF GEOMETRIC STANDARDS

Both the Urban Highway Design Guide and the Roads and Transportaion Association of Canada base the development of their ramp design standards on, "A Policy on the Geometric Design of Rural Highway", published by the American Association of State Highway Officials.

Acceleration and deceleration lengths differ between highway agencies and governing authorities due to the different assumptions that are made concerning the relationship between design speeds, average running speeds, merging speeds and diverging procedures.

In comparing the lengths of Canadian acceleration and deceleration lane lengths with those recommended by either ASSHO of European manuals, it was determined that Canadian standards consistently ranked high.

VEHICLE REGISTRATION TRENDS

Vehicle trends presented in this paper are predicated on projected extensions of todays technology. The reduction in average vehicle weight and horsepower will not come about because of the introduction of very small, low powered vehicles, but because of the cessation of producing large

high-powered passenger cars. Implications of this trend is that the future vehicle will be more homogeneous than they ever have been.

The most important determinant of acceleration performance capability is the horsepower to weight ratio. Horsepower to weight ratios will continue to decline although there will be little change in the acceleration performance.

HIGHWAY AND RAMP SPEEDS

From the speed studies, it was determined that running speeds on ramps approximate the design speed of the ramp,while vehicles on the mainline continue to travel at speeds which are less than the design speed.

ACCELERATION PERFORMANCE CHARACTERISTICS

This study has shown that normal acceleration rates of passenger vehicles as described in "A Policy on the Geometric Design of Rural Highways" are not sensitive to the operating characteristics of todays vehicle population at lower speed ranges.

Increased acceleration rates derived from the vehicle survey

are attributed to the improved operating characteristics of the existing vehicle population.

Minimum acceleration lengths should be based on vehicles accelerating from the average speed of the ramp controlling curve to 8 km/h less than the average running speed of through highway. Desirable acceleration lengths should be based on vehicles accelerating from the design speed of the ramp controlling curve to 8 km/h less than the design speed of the through highway.

A new acceleration design curve is proposed. By comparing the acceleration lengths based on this curve, with those lengths as suggested by both the Urban Highway Design Guide and Transportation Association of Canada, shorter acceleration lengths are required at lower speed ranges, resulting in a more sensitive design to ramp users and a savings in construction.

DECELERATION PERFORMANCE

Results of the passenger deceleration performance survey illustrates that existing design standards for deceleration lanes provide adequate lengths for passenger vehicles. Although acceleration performance capabilities have improved, deceleration performance of passenger vehicles has

not changed appreciably.

The design of deceleration lanes as recommended by The American Association of State Highway Officials continues to be relevant.

Minimum deceleration lengths should be based on vehicles decelerating from the average running speeds of the through highway to the design speed of the ramp controlling curve. Desirable deceleration lengths should be based on vehicles decelerating from the average running speed of the through highway to the average running speed of the ramp contolling curve.

8.3 RECOMMENDATIONS

In order to consider a more complete update of ramp design standards currently based on the AASHO acceleration and deceleration curves, an extensive survey of the type outlined in this report is suggested. The survey should, where possible, observe a wide range of traffic situations where acceleration manoeuvres are performed. This study should also consider the effects of ramp grades, the angle of convergence, ramp widths and other geometric variables which influence the behaviour of vehicles at entrance and

BIBLIOGRAPHY

1. American Association of State Highway Officials. "A Policy on the Geometric Design of Rural Highways." Washington, 1965.

2. American Association of State Highway and Transportation Officials. "A Policy on Design of Urban Highways and Arterial Streets." Washington, 1973.

3. Beakey,J., "Acceleration and Deceleration Characteristics of Private Passenger Vehicles." Highway Research Board, #18, 1938.

4. Buhr,J.H., Drew,D.R., Wattleworth,J.D., and Williams,T.G., "A Nationwide Study of Freeway Merging Operations". Highway Research Board, #202, 1967.

5. Canadian Automotive Trend. 1970-1978.

6. Claffey,P.J., "Running Costs of Motor Vehicles as Affected by Road Design and Traffic." NCHRP Report, 111, 1971.

7. Conklin,R.D., "A Comparison of Vehicle Operating Characteristics Between Parallel and Direct Taper Types of Freeway Off-Ramps." Traffic Engineering Journal, Dec, 1959.

8. De Leuw Cather Company of Canada Ltd., "Appraisal of Direct Taper and Parallel Lane Designs for Entrances and Exits on Freeways.", 1966.

9. Fisher,R.C., "Types and Lengths of Acceleration and Deceleration Lanes as They Effect Traffic Accidents." State Highway Department, New Jersey.

10. Forbes,T.W., "Effect of Small and Compact Cars on Traffic Flow and Saftey." Highway Research Board, #235, 1959.

11. Futukome,I. and Moskowitz,K., "Traffic Behaviour and On-Ramp Design." Highway Research Board, #235, 1959.

12. Futukome,I. and Moskowitz,K., "Traffic Behaviour and Off-Ramp Design." Highway Research Board, #21, 1960.

13. Glauz,W.D., Harwood,D.W. and St. John,A.D., "Projected Vehicle Characteristics Through 1955." Midwest Research Institute, 1980.

14. "Highway Capacity Manual." Highway Research Board Special Report, #87, 1965.

15. Head,J.D., "Traffic Control and Behaviour Ramp Terminals." ITE Proceedings, 1961.

16. Institute of Transportation Engineers. "Transportation and Traffic Enginering Handbook." Prentice-Hall, New Jersey, 1976.

17. Institute of Transportation Engineers. "Freeway Operations." 1961.

18. Jouzy,N.C., and Michael,H.L., "Use and Design of Acceleration and Deceleration Lanes in Indiana." Highway Research Record, #9, 1963.

19. Keese,C.J., Pinnell,C., McCasland,W.R., "A Study of Freeway Traffic Operations." Highway Research Board, #235, 1959.

20. Matson,T.M., Smith,W.S., and Hurd,F.W., "Traffic Engineering". McGraw-Hill, New York, 1955.

21. May,A.D., "Optimization Techniques Applied to Improving Freeway Operations." Engineering Optimization, vol.276.

22. Ministry of Transport. "Advisory Manual for the Layout of Roads in Rural Areas." Scottish Development Department, The Welsh Office, 1968.

23. Ministry of Transport. "Summary of the Dutch Standards on Geometric Design of Highways." Waterstaat Engineering Division.

24. Moskowitz,K., "Research on Operating Characteristics of Freeways." ITE Proceedings, 1956.

25. Normann,O.K., "Research Needed to Keep Pace With Changing Traffic." Traffic Quarterly, July, 1958.

26. National Cooperative Highway Research Program Design and Control of Reeway Off-Ramp Terminals." Research Board, #35, 1976.

27. National Cooperative Highway Research Program "Application of Vehicle Operating Characteristics to Geometric Design and Traffic Conditions." Highway Research Board, #68, 1969.

28. National Cooperative Highway Research Program. "Weaving Areas". Transportation Research Board, #159, 1975.

29. Pilkington,G.B., "Effect of the Energy Crisis on Existing Design Standards." Transportation Research Record, #601.

30. Pinnell,C., Keese,C.J., "Freeway Ramps." Texas Transportation Institute, Texas A & M College System.

31. Pinnell,C., "Driver Requirements in Freeway Entrance Ramp Design." ITE Proceedings, 1960.

32. Province of Alberta. "Urban Highway Design Guide." 1970.

33. Roads and Transportation Association of Canada. "Geometric Design Standards for Canadian Roads and Streets." Ottawa, 1976.

34. RoyalCanadian Mounted Police. "Radar Operators Manual." Ottawa, 1973.

35. Samuels,S.E., "Acceleration and Deceleration of Modern Vehicles." Australian Road Research, vol.6N, June 1976.

36. Segel,L.,"The Trend to Smaller and Lighter Cars; Does it Present an Increased Challenge to The Chasis Engineer." Society of Automotive Engineers, SAE 770040, 1973.

37. Seger and Brink "Trends of Vehicle and Performance Characteristics From 1960 to 1970." Highway Research Board, #420.

38. Solomon,D., "Highway Reseach and Vehicle Design for the 80's." Society of Automotive Engineers, SAE 770039, 1977.

39. Stonex,K.A., "Review of Vehicle Dimensions and Performance Characteristics." Highway Research Board Proc. 39, 1960.

40. Stonex,K.A., "Trends of Vehicle Dimensions and Performance Characteristics." Society of Automotive Engineers, paper 539A, 1962.

41. Tignor,S.C., "Braking Performance of Motor Vehicles." Public Roads, vol 34, no.4, 1966.

42. Wattleworth,J.D. Buhr,J.H. Drew,D.R. "Operational Effects of Some Entrance Ramp Geometrics on Freeway Merging." Highway Research Record, #208.

43. Webb,G.M., Moskowitz,K., "Freeway Capacity Study." Highway Research Board Proc. 1957.

44. Whitby,W.D., "Small Car Speeds and Spacings on Urban Expressways." Highway Research Board Bulletin, #351, 1962.

45. Wright,J.M., Tignor,S.C. "Relations of Gross Weights and Horsepowers of Commercial Vehicles." Public Roads, vol.34, no.4, 1966.

APPENDIX 1

ENTRANCE TERMINAL 1

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG 15/80
STUDY NUMBER 1

HIGHWAY 14 LOCATION SE RAMP 110M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 67 TRUCKS 16

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
78	1	0	1	0.3	0.0	0.3	0.38	0.0	0.33	100.00	100.00	100.00
76	0	0	0	0.7	0.0	0.7	0.77	0.0	0.65	99.62	100.00	99.67
74	1	0	1	0.3	0.0	0.3	0.38	0.0	0.33	98.85	100.00	99.02
72	1	0	1	0.3	0.0	0.3	0.38	0.0	0.33	98.46	100.00	98.70
70	0	0	0	0.7	0.0	0.7	0.77	0.0	0.65	98.08	100.00	98.37
68	2	0	2	1.3	0.0	1.3	1.54	0.0	1.30	97.31	100.00	97.72
66	2	0	2	1.3	0.0	1.3	1.54	0.0	1.30	95.77	100.00	96.42
64	5	0	5	5.0	0.0	5.0	3.85	0.0	3.26	91.92	100.00	93.16
62	7	0	7	6.3	0.0	6.3	5.77	0.0	4.89	86.15	100.00	88.27
60	6	0	6	7.0	0.0	7.0	7.31	0.0	6.19	78.85	100.00	82.08
58	8	0	8	7.7	0.0	7.7	8.00	0.0	6.84	70.77	100.00	75.24
56	9	0	9	9.3	0.0	9.3	8.85	0.0	7.49	61.92	100.00	67.75
54	11	0	11	9.7	0.0	9.7	10.77	0.0	9.12	51.15	100.00	58.63
52	9	0	9	9.0	0.0	9.0	11.15	0.0	9.45	40.00	100.00	49.19
50	7	0	7	8.0	1.7	9.7	10.38	0.0	8.79	29.62	100.00	40.39
48	8	5	13	6.3	1.7	8.0	9.23	10.64	9.45	20.33	89.36	30.64
46	4	0	4	4.7	2.0	6.7	7.31	10.64	7.82	11.08	79.72	23.13
44	2	2	4	2.3	1.0	3.3	5.38	12.77	6.51	3.69	69.36	16.61
42	1	2	3	1.3	2.3	3.7	2.69	6.38	3.36	1.69	56.56	13.35
40	1	4	5	0.7	3.0	3.7	1.54	14.89	3.58	1.00	37.57	9.77
38	0	0	0	0.3	1.7	2.0	0.77	12.77	2.61	0.46	14.68	7.17
36	0	1	1	0.7	0.7	1.3	0.38	10.64	1.95	0.69	11.92	5.21
34	2	1	3	0.7	1.0	1.7	0.77	4.26	1.30	2.31	21.28	3.91
32	0	1	1	0.7	1.0	1.7	0.77	6.38	1.63	1.54	17.02	2.61
30	0	1	1	0.0	0.7	0.7	0.0	4.26	0.65	-0.00	10.64	0.65

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	61.7	53.8	46.5	54.9	1.6	7.6	1.1
TRUCKS	47.2	40.7	33.4	41.5	2.8	5.8	2.0
COMBINED	60.9	52.2	43.0	52.8	1.7	8.8	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

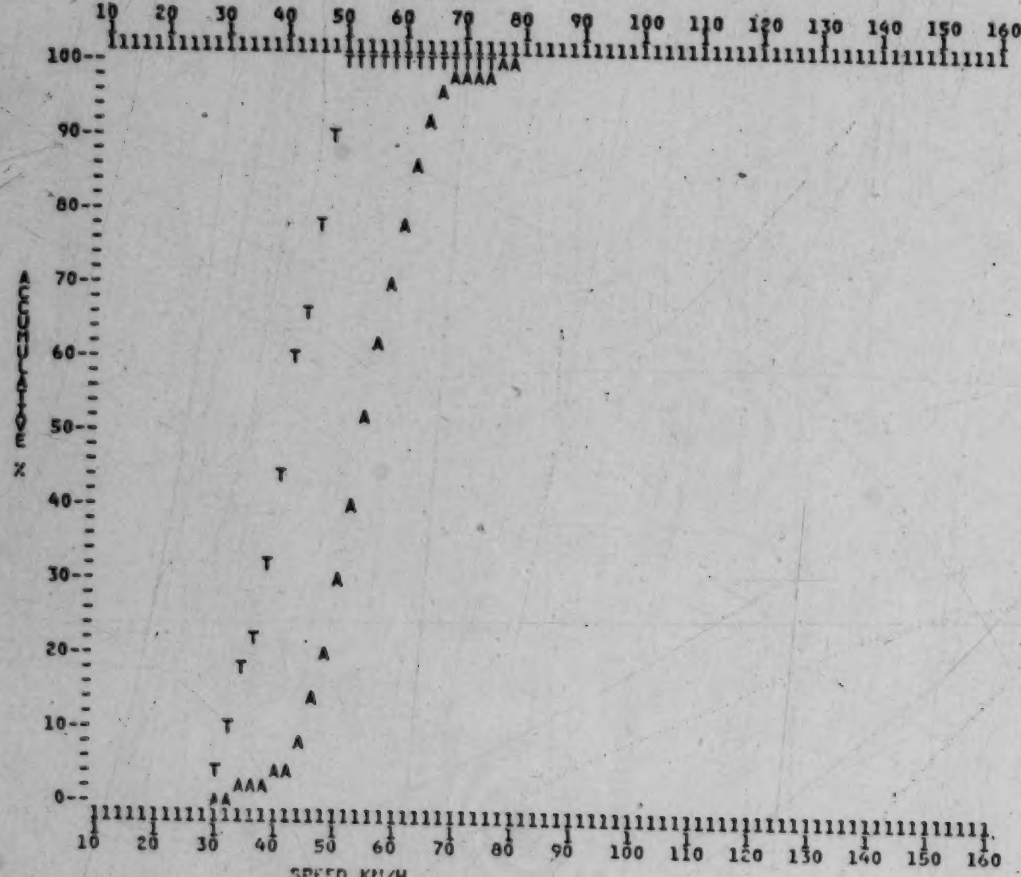
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 1

HIGHWAY 14 LOCATION SE RAMP 110M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H SAMPLE SIZE AUTOS 87
TRUCKS 50 KM/H TRUCKS 16

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG 15/80
STUDY NUMBER 2

HIGHWAY 14 LOCATION SE RAMP 150M E SOST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 99 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 83 TRUCKS 16

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
84	1	0	1	0.3	0.0	0.3	0.40	0.0	0.34	100.00	100.00	100.00
82	0	0	0	0.3	0.0	0.3	0.40	0.0	0.34	99.60	100.00	99.66
80	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	99.19	100.00	99.32
78	2	0	2	0.7	0.0	0.7	0.81	0.0	0.68	99.19	100.00	99.32
76	1	0	1	1.0	0.0	1.0	1.21	0.0	1.02	98.39	100.00	98.64
74	4	0	4	2.3	0.0	2.3	3.82	0.0	3.35	97.18	100.00	97.63
72	2	0	2	2.0	0.0	2.0	5.45	0.0	5.01	94.35	100.00	95.35
70	4	0	4	4.7	0.0	4.7	5.65	0.0	4.75	91.24	100.00	93.33
68	6	0	6	6.0	0.0	6.0	7.26	0.0	6.10	86.29	100.00	88.47
66	8	0	8	9.3	0.0	9.3	11.59	0.0	9.49	79.03	100.00	82.37
64	11	0	11	10.0	0.0	10.0	13.10	0.0	10.17	67.74	100.00	72.80
62	11	0	11	11.0	0.0	11.0	13.51	0.0	11.19	55.65	100.00	63.90
60	6	0	6	9.0	0.0	9.0	10.69	0.0	9.15	42.34	100.00	51.61
58	10	0	10	6.7	0.3	7.0	10.48	2.13	9.15	31.45	100.00	42.37
56	4	1	5	6.3	1.3	7.7	7.66	8.51	7.80	20.97	97.87	33.22
54	1	2	3	5.0	1.7	6.7	5.05	10.64	6.78	13.31	89.36	25.42
52	1	2	3	3.0	1.7	4.7	2.42	10.64	3.73	8.26	78.72	18.64
50	1	2	3	1.0	1.7	2.7	1.21	8.51	2.37	4.84	68.09	12.42
48	1	2	3	1.0	1.3	2.3	1.61	14.89	3.73	3.63	59.57	9.32
46	2	2	4	1.0	1.3	2.3	1.21	14.89	3.39	2.02	44.68	5.61
44	0	1	1	0.7	1.0	1.7	0.81	12.77	2.71	0.81	29.79	2.42
42	0	1	1	0.0	1.0	1.0	0.0	6.38	1.02	-0.00	17.02	1.71
40	0	1	1	0.0	0.7	0.7	0.0	4.26	0.68	-0.00	10.64	1.69
38	0	0	0	0.0	0.7	0.7	0.0	4.26	0.68	-0.00	6.38	1.02
36	0	1	1	0.0	0.3	0.3	0.0	2.13	0.34	-0.00	2.13	0.34

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	67.6	61.2	54.4	62.1	1.4	6.7	1.0
TRUCKS	53.2	46.7	41.4	47.9	2.6	5.3	1.9
COMBINED	66.9	59.7	50.0	59.8	1.6	6.3	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

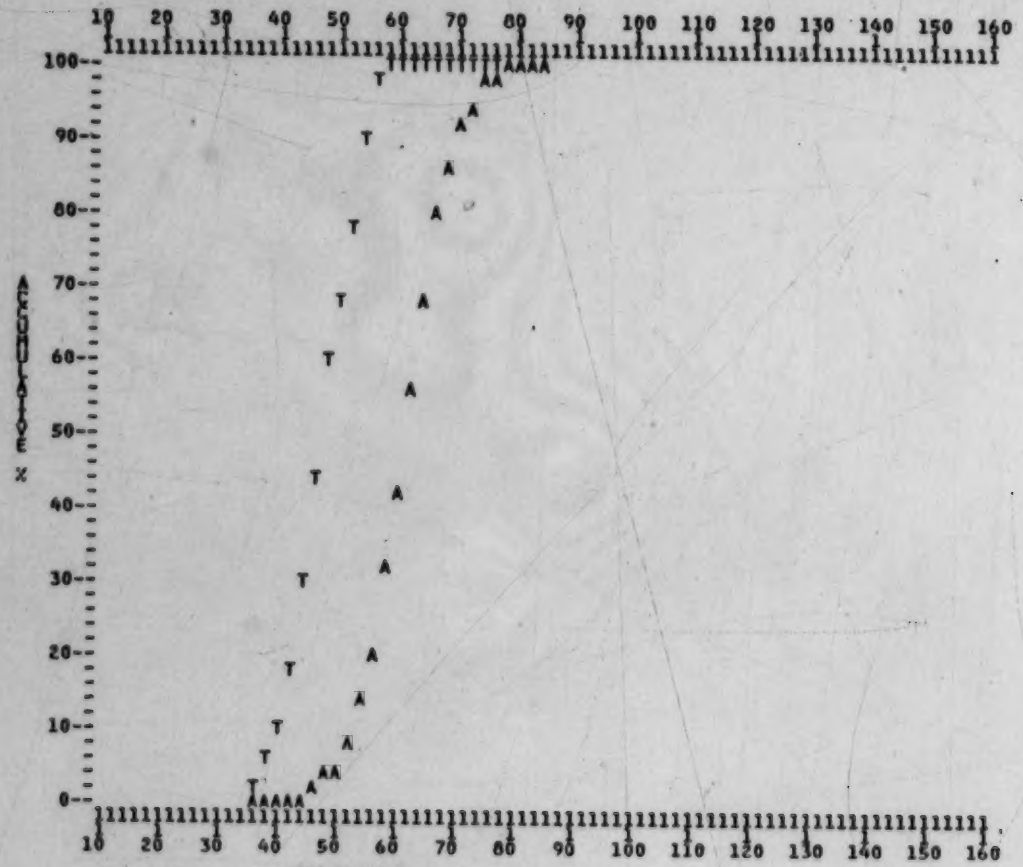
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG 15/80
STUDY NUMBER 2

HIGHWAY 14 LOCATION SE RAMP 150M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 99 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 63 TRUCKS 16

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPO ION
TRANSPORTATION SAFETY BR -H
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 3

HIGHWAY 14 LOCATION SE RAMP 190M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 99 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 84 TRUCKS 15

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
96	1	0	1	0.3	0.0	0.3	0.40	0.0	0.34	100.00	100.00	100.00
94	0	0	0	0.3	0.0	0.3	0.40	0.0	0.34	99.60	100.00	99.66
92	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	99.20	100.00	99.32
90	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	99.20	100.00	99.32
88	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	99.20	100.00	99.32
86	0	0	0	0.3	0.0	0.3	0.40	0.0	0.34	99.20	100.00	99.32
84	1	0	1	1.0	0.0	1.0	1.20	0.0	1.02	98.80	100.00	98.98
82	2	0	2	2.0	0.0	2.0	2.39	0.0	2.03	97.61	100.00	97.97
80	2	0	2	2.7	0.0	2.7	2.39	0.0	2.03	95.22	100.00	95.93
78	2	0	2	2.3	0.0	2.3	2.39	0.0	2.03	92.83	100.00	93.22
76	1	0	1	2.3	0.0	2.3	2.39	0.0	2.37	90.44	100.00	90.85
74	2	0	2	4.7	0.0	4.7	5.58	0.0	4.75	88.05	100.00	88.47
72	10	0	10	7.3	0.0	7.3	8.79	0.0	7.46	82.47	100.00	83.73
70	9	0	9	7.7	0.0	7.7	9.56	0.0	7.80	73.68	100.00	76.27
68	4	0	4	9.0	0.0	9.0	10.76	0.0	9.15	64.12	100.00	68.47
66	14	0	14	11.7	0.0	12.0	13.94	2.27	12.20	53.36	100.00	59.32
64	17	1	18	12.0	0.3	12.3	14.34	2.27	12.54	39.42	97.73	47.12
62	5	0	5	8.3	0.3	8.7	9.96	2.27	8.81	25.08	95.45	34.58
60	3	0	3	3.7	0.3	4.3	4.38	4.55	4.41	15.12	93.18	25.76
58	3	2	5	2.3	1.3	3.7	2.79	9.09	3.73	10.74	88.64	21.36
56	1	2	3	2.0	2.0	4.0	2.39	13.64	4.07	7.95	79.55	17.63
54	2	1	4	1.0	1.7	2.7	1.20	11.36	2.71	5.56	65.91	13.56
52	0	1	1	0.7	2.0	2.7	0.80	13.64	2.71	4.36	54.55	10.85
50	0	1	1	0.3	2.3	2.7	0.40	15.91	2.71	3.59	40.91	8.14
48	1	1	2	0.7	2.0	2.7	0.80	13.64	2.71	3.19	25.00	5.42
46	1	0	1	0.7	1.0	1.7	0.80	6.82	1.69	2.39	11.36	2.71
44	0	0	0	0.3	0.3	0.7	0.40	2.27	0.68	1.20	4.55	1.02
42	0	1	1	0.0	0.3	0.3	0.0	2.27	0.34	-0.00	2.27	0.34

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	73.5	65.7	60.2	67.4	1.6	7.6	1.2
TRUCKS	57.2	51.3	46.5	52.8	2.7	5.2	1.9
COMBINED	72.5	64.5	54.7	65.2	1.8	9.0	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

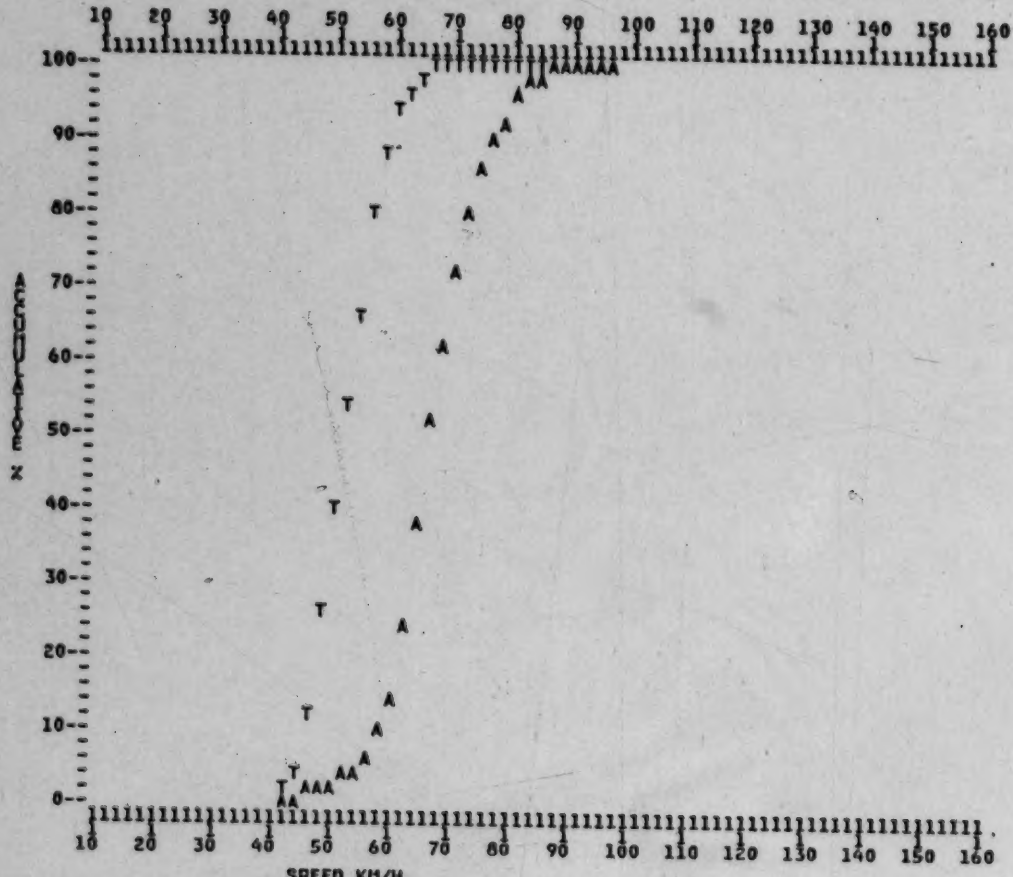
ALBERTA DEPARTMENT OF TRANSPOR[illegible]ON
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 3

HIGHWAY 14 LOCATION SE RAMP 190M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 99 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H SAMPLE SIZE AUTOS 84
TRUCKS 50 KM/H TRUCKS 15

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG 15/80
STUDY NUMBER 4

HIGHWAY 14 LOCATION SE RAMP 230M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 87 TRUCKS 16

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
88	2	0	2	1.0	0.0	1.0	1.16	0.0	0.98	100.00	100.00	100.00
86	1	0	1	1.7	0.0	1.7	1.93	0.0	1.63	98.84	100.00	99.02
84	2	0	2	2.3	0.0	2.3	2.70	0.0	2.26	96.91	100.00	97.39
82	4	0	4	3.5	0.0	3.5	4.86	0.0	4.07	94.21	100.00	95.10
80	4	0	4	3.5	0.0	3.5	4.86	0.0	4.07	90.35	100.00	91.03
78	2	0	2	3.5	0.0	3.5	4.86	0.0	4.07	86.49	100.00	86.96
76	4	0	4	4.2	0.0	4.2	5.41	0.0	4.50	82.63	100.00	82.89
74	6	0	6	5.7	0.0	5.7	6.68	4.26	6.17	77.22	100.00	78.39
72	11	0	11	6.3	0.7	6.3	9.27	4.26	8.50	68.34	95.74	72.22
70	5	0	5	9.7	0.7	9.7	11.20	8.51	10.78	57.07	91.49	64.05
68	13	2	15	8.0	1.5	11.0	9.27	4.26	8.50	47.86	82.98	53.27
66	6	0	6	9.0	0.7	8.7	10.42	6.38	9.80	38.61	78.72	44.77
64	9	1	9	9.0	1.0	10.0	7.34	4.26	6.86	28.19	72.34	34.97
62	5	1	6	6.3	0.7	7.0	6.95	4.26	6.86	20.85	68.09	28.10
60	5	1	6	6.0	1.0	7.0	5.02	4.26	4.90	13.90	63.70	21.24
58	3	0	3	4.3	0.7	5.0	3.86	8.51	4.58	8.68	57.45	16.34
56	3	0	3	3.3	1.3	4.7	1.93	8.51	3.27	4.82	48.94	11.76
54	1	0	1	1.7	1.0	2.7	1.93	6.38	2.61	2.92	40.43	8.50
52	1	0	1	1.0	1.7	2.7	1.16	10.64	2.61	1.00	34.04	5.88
50	0	1	1	0.3	1.0	1.3	0.39	6.38	1.31	0.77	23.40	3.27
48	1	1	2	0.7	1.3	2.0	0.77	8.51	1.96	0.77	17.02	3.27
46	0	1	1	0.3	1.0	1.3	0.39	6.38	1.31	0.39	10.64	1.96
44	0	1	1	0.0	0.7	0.7	0.0	4.26	0.65	-0.00	4.26	0.65

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	77.2	68.4	60.3	69.5	1.7	8.0	1.2
TRUCKS	68.5	56.2	47.4	58.2	4.3	8.7	3.1
COMBINED	75.9	67.2	57.4	67.8	1.8	9.1	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

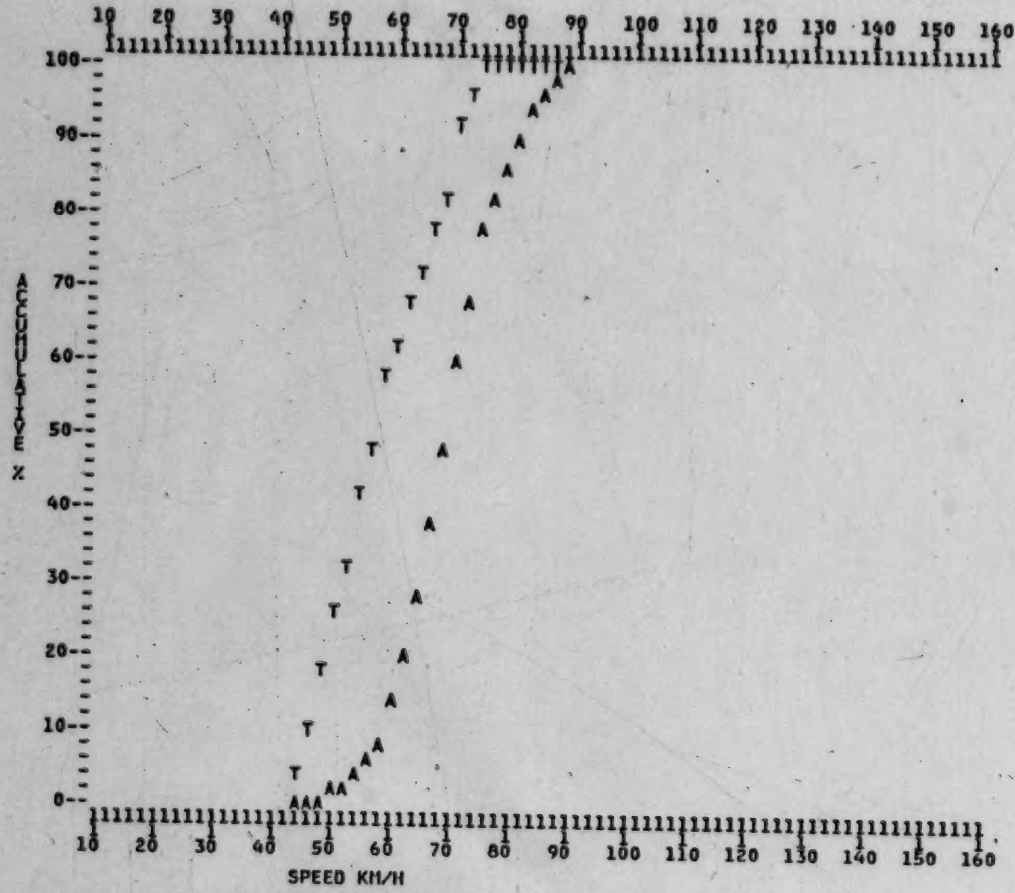
ALBERTA DEPARTMENT OF TRANSPOR ON
TRANSPORTATION SAFETY BRA
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 4

HIGHWAY 14 LOCATION SE RAMP 230M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H SAMPLE SIZE AUTOS 87
TRUCKS 50 KM/H TRUCKS 16

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 5

HIGHWAY 14 LOCATION SE RAMP 270M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 102 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 86 TRUCKS 16

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
96	1	0	1	0.3	0.0	0.3	0.39	0.0	0.33	100.00	100.00	100.00
94	0	0	0	0.3	0.0	0.3	0.39	0.0	0.33	99.61	100.00	99.67
92	0	0	0	1.0	0.0	1.0	1.17	0.0	0.99	99.22	100.00	99.34
90	0	0	0	1.0	0.0	1.0	1.17	0.0	0.99	98.05	100.00	98.36
88	0	0	0	1.3	0.0	1.3	1.56	0.0	1.32	96.89	100.00	97.37
86	1	0	1	1.0	0.0	1.0	1.17	0.0	0.99	95.33	100.00	96.05
84	1	0	1	1.7	0.0	1.7	1.95	0.0	1.64	94.16	100.00	95.07
82	2	0	2	2.3	0.0	2.3	2.72	0.0	2.30	92.22	100.00	93.42
80	3	0	3	4.7	0.0	4.7	5.45	0.0	4.61	89.49	100.00	91.12
78	4	0	4	6.3	0.0	6.3	7.39	0.0	6.25	84.05	100.00	86.51
76	7	0	7	8.0	0.3	8.3	10.51	2.13	9.21	76.65	100.00	80.26
74	11	1	12	8.0	0.3	8.3	9.34	2.13	8.22	66.15	97.87	71.05
72	6	0	6	8.0	0.7	8.7	9.34	4.26	8.55	56.81	95.74	62.83
70	7	1	8	9.0	0.7	9.7	8.17	4.26	7.57	47.47	91.49	54.28
68	8	1	9	9.0	0.7	9.7	10.51	4.26	9.54	39.30	87.23	46.71
66	12	0	12	9.0	1.0	10.0	10.51	6.38	9.87	28.79	82.98	37.17
64	5	2	9	7.3	1.0	8.3	6.56	6.38	6.22	18.29	76.60	27.30
62	3	1	4	5.7	1.3	5.0	4.28	8.51	4.93	9.73	70.21	19.08
60	1	1	2	1.7	1.0	2.7	1.95	6.38	2.63	5.45	61.70	14.14
58	1	1	2	1.0	1.0	2.0	1.17	6.38	1.97	3.50	55.32	11.51
56	1	1	2	1.0	1.0	2.0	1.17	6.38	1.97	2.33	48.94	9.54
54	1	1	2	0.7	2.0	2.7	0.78	12.77	1.63	1.17	42.55	7.57
52	0	4	4	0.3	2.0	2.3	0.39	12.77	1.30	0.39	29.79	5.93
50	0	1	1	0.0	1.7	1.7	0.0	10.64	1.64	-0.00	17.02	4.63
48	0	0	0	0.0	0.7	0.7	0.0	4.26	0.66	-0.00	6.38	2.63
46	0	1	1	0.0	0.3	0.3	0.0	2.13	0.33	-0.00	2.13	0.33

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	78.4	70.5	63.2	71.9	1.6	7.8	1.2
TRUCKS	66.9	56.3	49.6	58.7	3.8	7.7	2.7
COMBINED	77.5	68.9	60.3	69.9	1.8	9.1	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

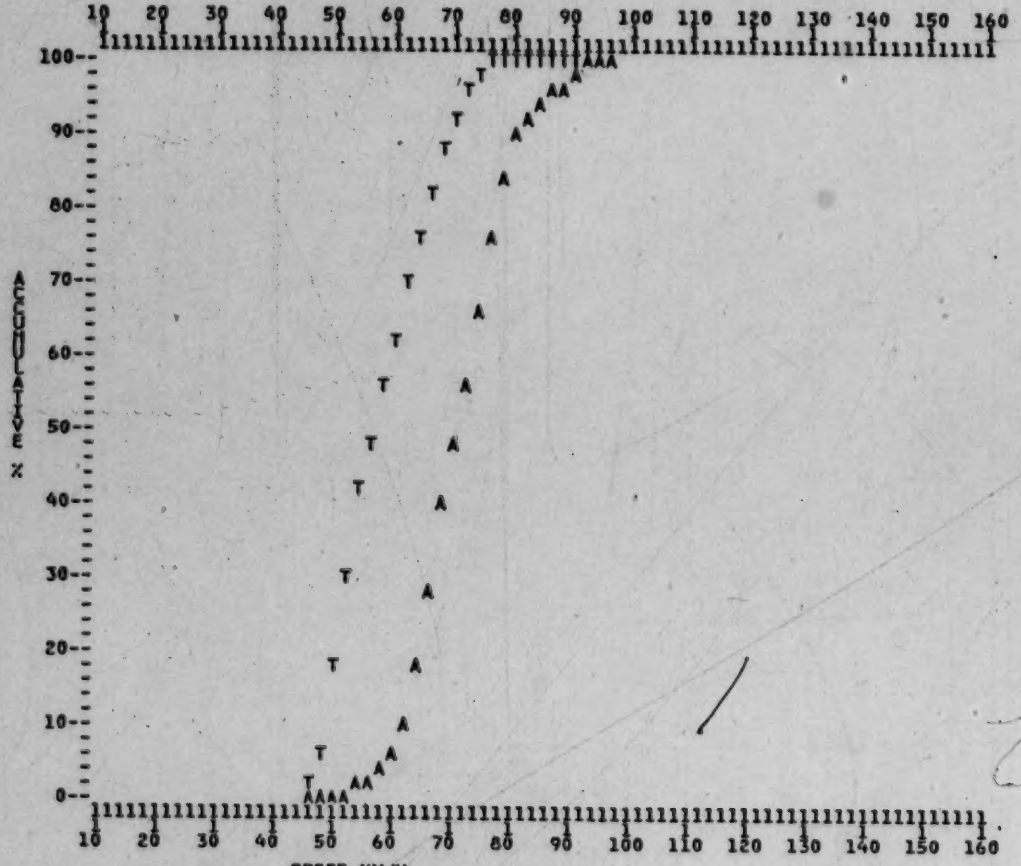
ALBERTA DEPARTMENT OF TRANSPOR ON
TRANSPORTATION SAFETY BRA...H
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG 15/80
STUDY NUMBER 5

HIGHWAY 14 LOCATION SE RAMP 270M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 102 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H SAMPLE SIZE AUTOS 86
TRUCKS 50 KM/H TRUCKS 16

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

HIGHWAY 14 LOCATION SE RAMP 310M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 105 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 86 TRUCKS 17

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
98	1	0	1	0.3	0.0	0.3	0.38	0.0	0.32	100.00	100.00	100.00
96	0	0	0	0.3	0.0	0.3	0.38	0.0	0.32	99.62	100.00	99.68
94	0	0	0	1.3	0.0	1.3	1.52	0.0	1.28	99.24	100.00	99.36
92	4	0	4	1.3	0.0	1.3	1.52	0.0	1.28	97.72	100.00	98.08
90	0	0	0	1.7	0.0	1.7	1.90	0.0	1.60	96.20	100.00	96.81
88	1	0	1	0.7	0.0	0.7	0.76	0.0	0.64	94.30	100.00	95.21
86	1	0	1	1.3	0.0	1.3	1.52	0.0	1.28	93.54	100.00	94.57
84	2	0	2	1.7	0.0	1.7	1.90	0.0	1.60	92.02	100.00	93.29
82	2	0	2	3.3	0.0	3.3	3.80	0.0	3.19	90.11	100.00	91.69
80	5	0	5	5.3	0.3	5.7	6.08	2.00	5.43	86.31	100.00	88.50
78	6	0	6	7.7	0.7	8.3	8.75	4.00	7.99	80.23	98.00	83.07
76	9	1	10	9.7	0.7	10.3	11.03	4.00	9.90	71.48	94.00	75.08
74	12	0	12	9.3	0.3	9.7	10.65	2.00	9.27	60.46	90.00	65.18
72	7	0	7	9.3	0.0	9.3	10.65	0.0	8.55	49.81	88.00	55.91
70	9	0	9	8.3	0.7	9.0	9.51	4.00	8.23	39.16	88.00	46.96
68	9	2	11	8.3	1.0	9.3	9.51	6.00	8.55	29.68	84.00	38.74
66	7	1	8	6.0	1.3	7.3	6.84	8.00	7.03	20.15	78.00	30.39
64	2	1	3	4.0	1.0	5.0	4.56	6.00	4.79	13.31	70.00	23.36
62	3	1	4	2.0	1.0	3.0	2.28	6.00	2.08	8.75	64.00	17.57
60	1	1	2	2.0	1.0	3.0	2.28	6.00	2.08	6.46	58.00	14.70
58	1	1	2	2.0	0.7	3.0	2.28	6.00	2.08	4.18	52.00	11.82
56	1	0	1	1.0	0.7	2.0	1.52	4.00	1.92	2.66	46.00	9.90
54	0	2	2	0.7	0.7	2.0	1.14	12.00	2.08	1.52	36.00	7.03
52	1	2	3	0.3	0.7	1.7	0.76	14.00	2.08	0.76	22.00	4.15
50	0	0	0	0.3	0.7	1.0	0.38	14.00	2.56	0.38	8.00	1.60
48	0	0	0	0.3	0.3	0.3	0.38	4.00	0.96	-0.00	4.00	0.64
46	0	1	1	0.0	0.3	0.3	0.0	2.00	0.32	-0.00	2.00	0.32

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	79.6	72.0	64.5	73.2	1.7	8.3	1.2
TRUCKS	60.5	57.0	51.0	60.3	4.1	8.6	2.9
COMBINED	78.7	70.7	60.2	71.2	1.8	9.6	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

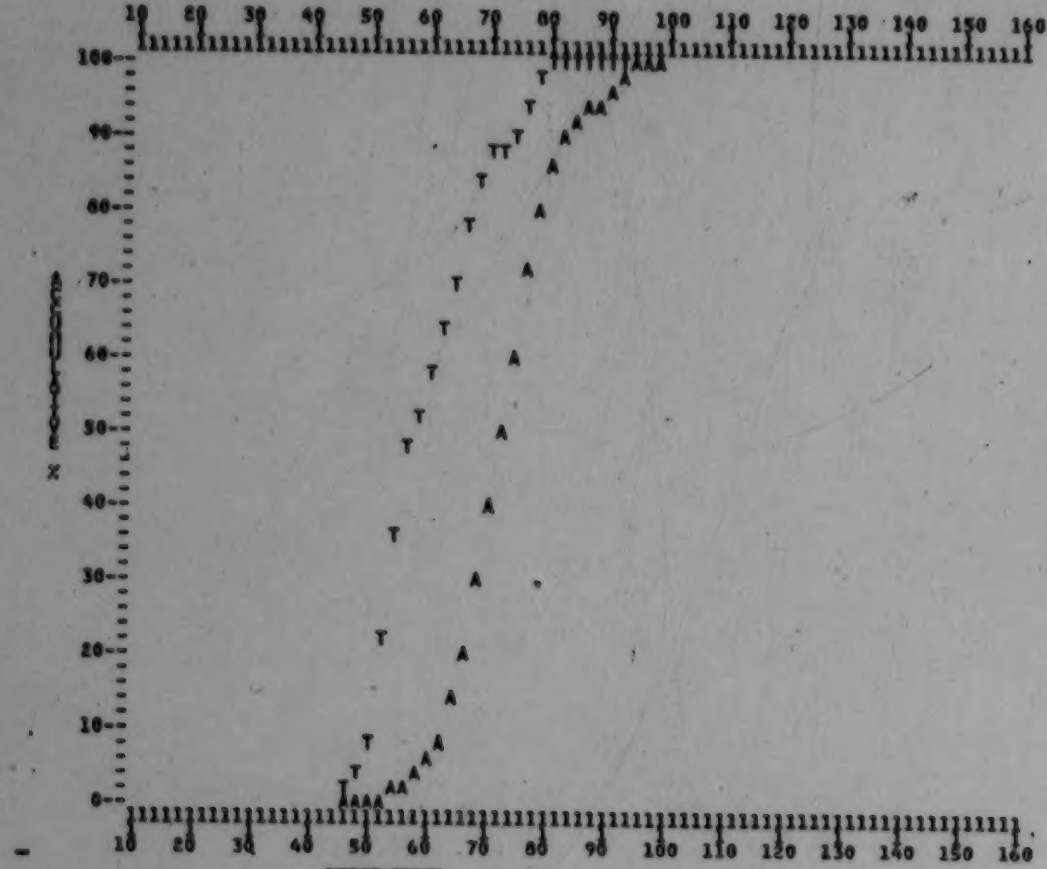
ALBERTA DEPARTMENT OF TRANSPOR[illegible]ON
TRANSPORTATION SAFETY BR[illegible]H
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG 15/80
STUDY NUMBER 6

HIGHWAY 14 LOCATION SE RAMP 310M E 50ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 105 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 60 TRUCKS 17

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 1330 STOP TIME 1430 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE X VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION .1KM E 50 ST & SE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 132 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 84 TRUCKS 13

DATE 28 5 80 LIGHT CONDITIONS-- DAY START TIME 945 STOP TIME 1030 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
62	1	0	1	1.0	0.0	1.0	1.20	0.0	1.02	100.00	100.00	100.00
60	1	0	1	1.2	0.0	1.2	1.20	0.0	1.02	98.80	100.00	98.98
58	2	0	2	2.2	0.0	2.2	2.40	0.0	2.04	97.60	100.00	97.96
56	3	0	3	3.2	0.0	3.2	3.60	0.0	3.06	95.20	100.00	95.92
54	4	0	4	4.2	0.0	4.2	4.40	0.0	3.74	91.60	100.00	94.82
52	5	0	5	5.0	0.0	5.0	6.00	0.0	5.10	87.20	100.00	90.82
50	6	0	6	6.3	0.0	6.3	7.60	0.0	6.46	81.20	100.00	85.71
48	9	0	9	8.3	0.3	8.7	10.80	2.27	9.69	73.60	100.00	78.74
46	10	1	11	9.7	1.3	11.0	12.00	9.09	11.22	62.80	97.73	70.07
44	11	2	13	10.7	2.3	13.0	13.20	18.18	13.50	50.80	88.64	58.85
42	10	1	11	10.0	1.3	11.3	12.00	9.09	11.56	37.60	70.45	45.35
40	8	2	10	9.0	2.3	11.3	9.60	18.18	11.56	25.60	61.36	33.80
38	4	1	5	6.7	2.0	8.7	4.80	18.18	8.50	16.00	43.18	22.24
36	3	1	4	5.0	2.0	7.0	3.60	18.18	7.48	11.20	25.00	13.74
34	3	1	4	3.8	2.0	5.8	3.60	18.18	6.46	7.60	6.82	6.26
32	1	0	1	2.3	0.7	3.0	1.20	0.0	2.72	4.00	0.00	3.06
30	0	0	0	1.3	0.7	2.0	0.0	0.0	1.70	2.80	0.00	2.04
28	0	1	1	0.7	0.7	1.3	0.0	9.09	2.38	2.80	0.00	2.38
26	0	1	1	0.0	0.3	0.3	0.0	2.27	0.34	0.00	2.27	0.34

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	52.6	45.3	38.6	46.5	1.4	6.6	1.0
TRUCKS	45.4	36.7	30.4	38.5	3.3	6.4	2.3
COMBINED	51.8	44.5	36.4	45.3	1.4	7.2	1.0

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

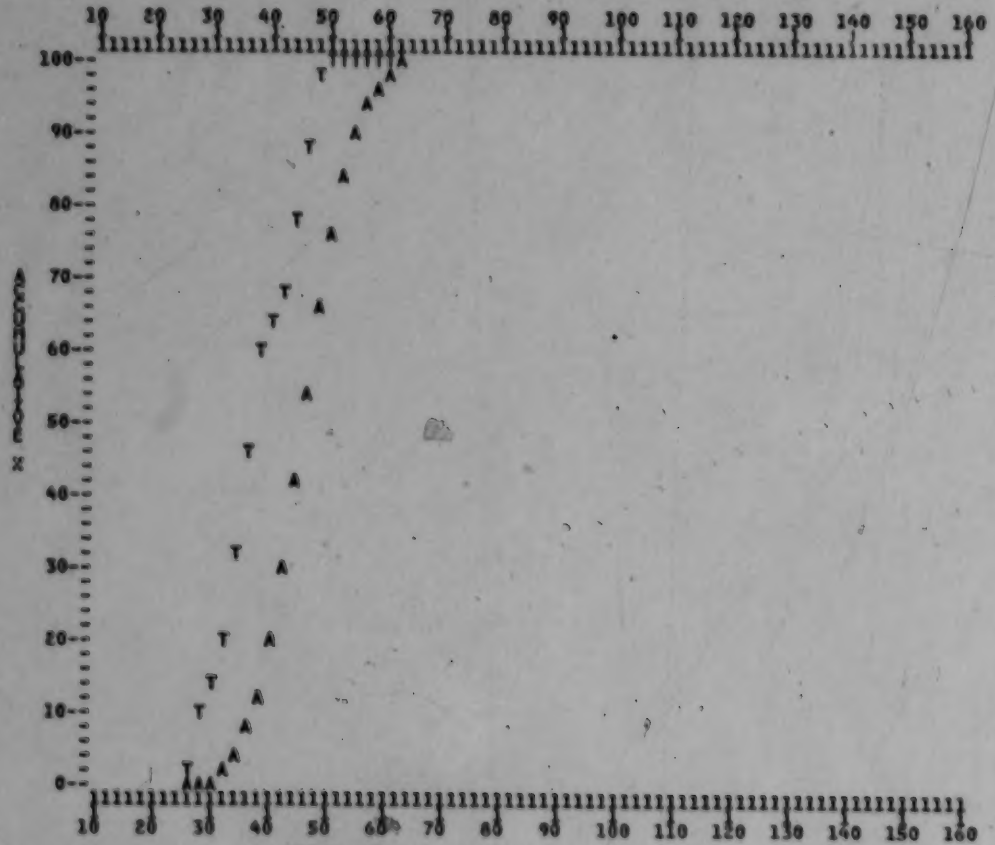
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION .1KM E 50 ST & SE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 132 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 84 TRUCKS 15

DATE 20 S 80 LIGHT CONDITIONS-- DAY START TIME 945 STOP TIME 1030 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE X VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION .2KM E 50 ST SE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 134 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 84 TRUCKS 17

DATE 20 5 80 LIGHT CONDITIONS-- DAY START TIME 945 STOP TIME 1030 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
82	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	100.00	100.00	100.00
80	0	0	0	0.7	0.0	0.7	0.60	0.0	0.66	99.60	100.00	99.67
78	1	0	1	0.7	0.0	0.7	0.80	0.0	0.66	99.00	100.00	99.00
76	1	0	1	0.7	0.0	0.7	0.80	0.0	0.66	98.00	100.00	98.34
74	0	0	0	1.7	0.0	1.7	2.00	0.0	1.66	97.20	100.00	97.67
72	4	0	4	2.3	0.0	2.3	3.60	0.0	3.33	95.20	100.00	96.01
70	3	0	3	2.3	0.0	2.3	3.20	0.0	2.66	91.60	100.00	93.69
68	1	0	1	2.3	0.0	2.3	3.60	0.0	3.33	88.40	100.00	91.03
66	1	0	1	2.0	0.0	2.0	3.60	0.0	3.33	84.80	100.00	88.70
64	2	0	2	2.0	0.0	2.0	4.00	0.0	4.98	82.80	100.00	85.71
62	2	0	2	2.0	0.7	2.0	4.60	3.92	4.98	78.80	100.00	80.73
60	2	0	2	2.3	1.7	2.3	4.60	7.84	4.98	74.20	96.08	75.75
58	10	2	12	8.0	1.7	11.0	10.80	11.76	10.36	69.60	88.24	71.42
56	10	2	12	8.7	1.7	10.3	10.40	9.80	10.30	58.80	76.47	53.49
54	9	1	10	8.3	1.3	9.7	10.00	7.84	9.63	48.40	66.67	43.19
52	7	1	8	7.7	1.3	9.0	8.00	7.84	7.97	38.40	58.82	33.55
50	6	1	7	7.7	1.3	7.0	6.80	7.84	6.98	30.40	50.98	25.58
48	3	1	4	7.7	1.0	3.7	3.20	5.88	3.65	23.60	43.14	18.60
46	0	0	0	3.7	0.7	3.3	2.00	3.92	2.33	20.40	37.26	14.95
44	2	1	3	0.7	0.7	1.3	0.80	3.92	1.33	8.40	33.33	12.62
42	0	1	1	1.7	1.7	2.3	2.00	9.80	2.33	7.60	29.41	11.30
40	3	3	6	1.0	1.3	2.3	1.20	7.84	2.33	5.60	19.61	7.97
38	0	0	0	1.7	1.3	3.0	2.00	7.84	2.99	4.40	11.77	5.65
36	2	0	3	1.0	0.3	1.3	1.20	1.96	1.33	2.40	3.92	2.66
34	1	0	1	1.0	0.3	1.3	1.20	1.96	1.33	1.20	1.96	1.33

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	65.2	56.2	48.4	57.3	1.9	9.1	1.4
TRUCKS	57.4	49.7	38.8	49.6	3.8	7.9	2.7
COMBINED	63.7	55.3	46.0	56.0	1.8	9.3	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

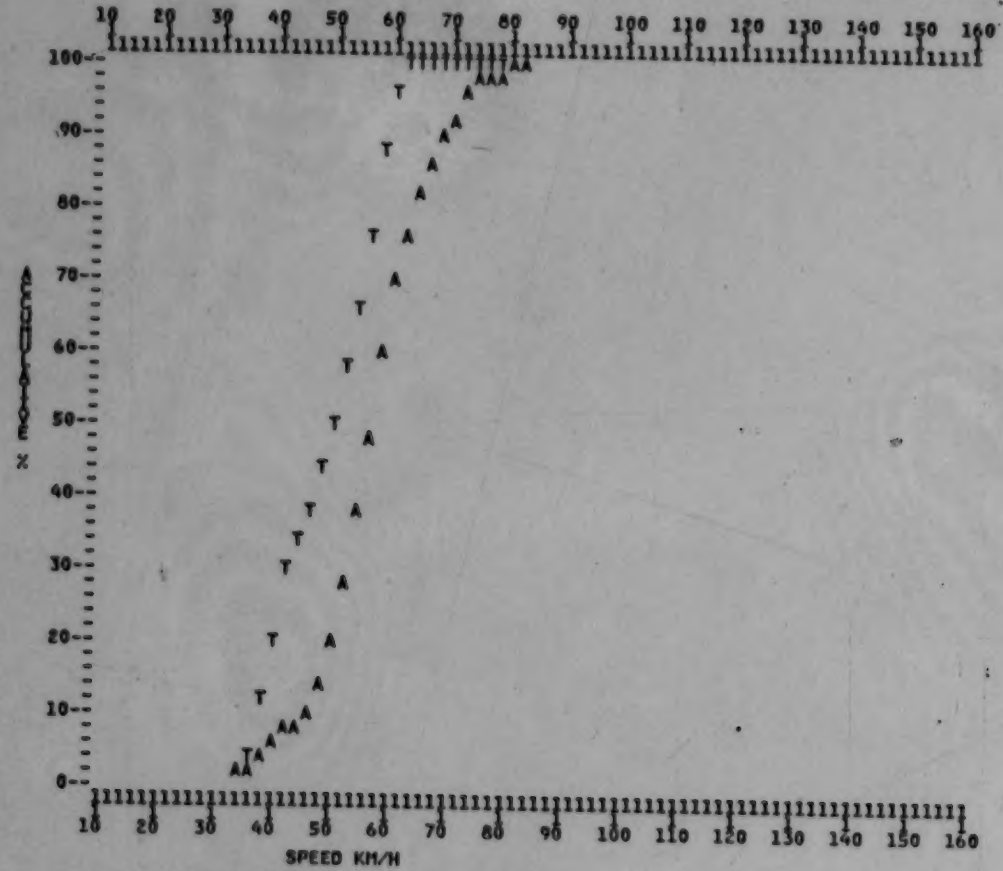
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION .2KM E 50 ST SE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 134 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 84
TRUCKS 60 KM/H TRUCKS 17

DATE 20 5 80 LIGHT CONDITIONS-- DAY START TIME 945 STOP TIME 1030 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 20/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION SE RAMP .1 KM EAST OF 50TH ST TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 165 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 46 TRUCKS 0

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 0 0 STOP TIME 820 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
56	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
52	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
50	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
48	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
46	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
44	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
42	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
40	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
38	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
36	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
34	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
32	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
30	0	0	0	0.7	0.3	1.0	0.00	0.00	0.00	100.00	100.00	100.00
28	0	1	1	0.0	0.7	0.7	0.00	7.69	1.23	0.00	15.38	1.23

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	52.2	45.3	39.4	46.6	1.6	5.4	1.1
TRUCKS	50.1	40.0	29.9	41.5	5.3	7.9	3.7
COMBINED	52.0	44.6	36.4	45.8	1.7	6.2	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

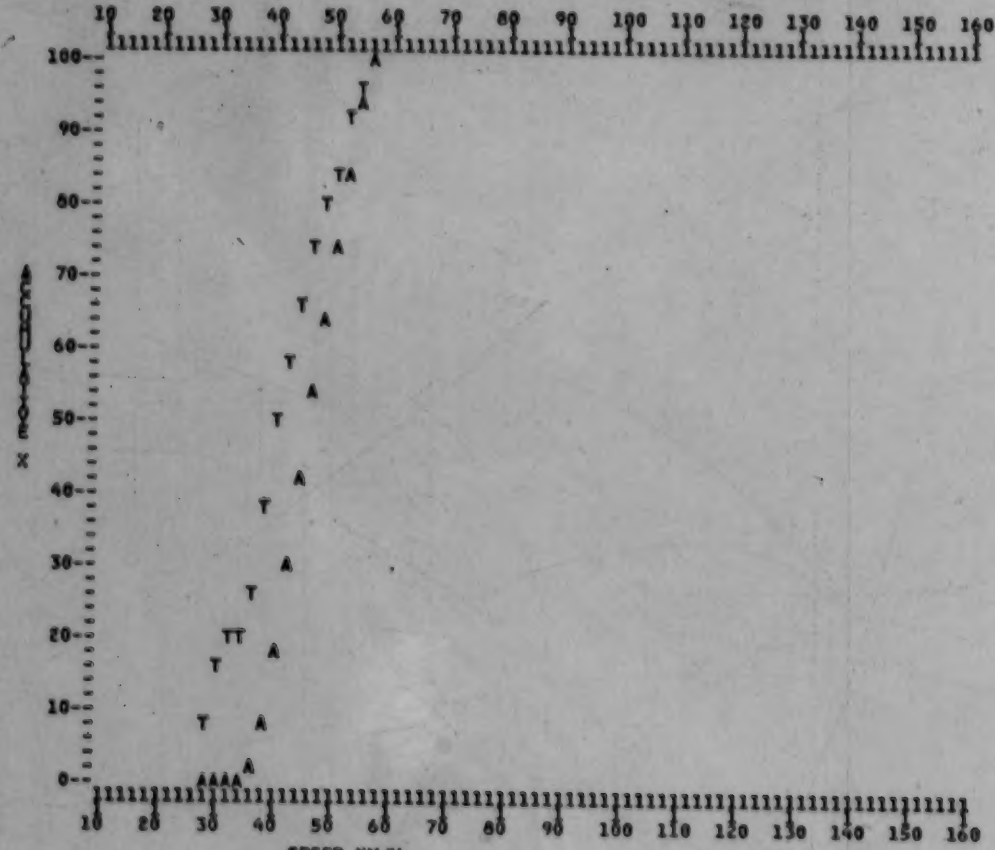
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1480

HIGHWAY 14 LOCATION SE RAMP .1 KM EAST OF 50TH ST TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 165 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 46 TRUCKS 9

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 8 0 STOP TIME 820 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE X VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION SE RAMP .2 KM EAST OF 50TH ST TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 136 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 48 TRUCKS 9

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 825 STOP TIME 850 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
80	1	0	1	0.3	0.0	0.3	0.70	0.0	0.59	100.00	100.00	100.00
78	0	0	0	0.3	0.0	0.3	0.70	0.0	0.59	99.30	100.00	99.41
76	0	0	0	0.7	0.0	0.7	1.40	0.0	1.18	98.60	100.00	98.82
74	2	0	2	1.3	0.0	1.3	2.80	0.0	2.37	97.20	100.00	97.63
72	2	0	2	1.3	0.0	1.3	2.80	0.0	2.37	94.41	100.00	95.27
70	0	0	0	1.0	0.0	1.0	2.10	0.0	1.78	91.61	100.00	92.90
68	1	0	1	1.0	0.0	1.0	2.10	0.0	1.78	89.51	100.00	91.12
66	2	0	2	1.7	0.7	1.3	5.59	7.69	5.92	87.41	100.00	89.34
64	3	1	4	2.7	1.0	4.7	7.69	11.54	8.28	81.82	92.31	83.43
62	10	1	11	6.7	1.3	8.0	13.99	15.38	14.20	74.13	80.77	75.15
60	6	0	6	9.3	0.7	7.0	13.29	7.69	12.43	60.14	65.38	60.95
58	4	0	4	6.7	0.3	7.0	13.99	3.85	12.43	46.85	57.69	48.52
56	4	0	4	4.7	0.0	4.7	9.79	0.0	8.28	32.87	53.85	36.09
54	3	0	3	3.7	1.0	4.7	7.69	11.54	8.28	23.08	53.85	27.81
52	1	0	1	2.7	1.0	3.7	5.59	11.54	6.51	15.38	42.31	19.53
50	1	0	1	2.3	1.0	3.3	4.90	11.54	5.92	9.79	30.77	13.02
48	0	0	0	1.3	0.0	1.3	2.80	0.0	2.37	4.90	19.23	7.10
46	1	0	1	1.3	0.3	1.7	2.80	0.0	2.37	2.10	19.23	4.73
44	0	1	1	0.3	0.7	1.0	0.70	7.69	1.78	0.70	7.69	1.78

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	66.4	60.2	53.1	61.1	1.9	6.7	1.3
TRUCKS	64.7	55.3	45.9	57.2	5.1	7.6	3.6
COMBINED	66.0	60.0	52.1	60.5	1.8	7.0	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

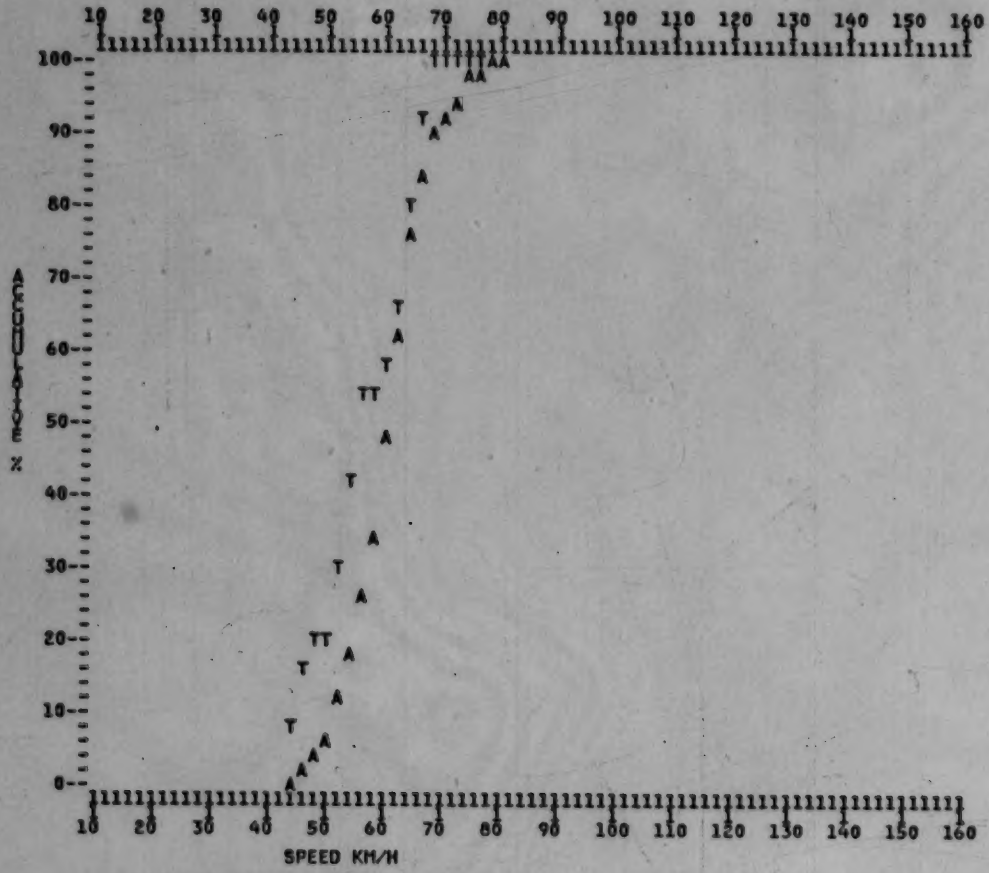
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION SE RAMP .2 KM EAST OF 50TH ST TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 136 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 48
TRUCKS 60 KM/H TRUCKS 9

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 825 STOP TIME 850 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

160

ALBERTA DEPARTMENT OF TRANSPO ION
TRANSPORTATION SAFETY BR...CH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION SE RAMP .1 KM EAST OF 50TH ST TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 165 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 46 TRUCKS 9

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 8 0 STOP TIME 820 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
56	2	0	2	2.7	0.3	3.0	5.88	3.85	5.56	100.00	100.00	100.00
54	6	1	7	4.7	0.3	5.0	10.29	3.85	9.26	94.12	96.15	94.44
52	6	0	6	4.3	0.7	5.0	9.56	7.69	9.26	83.82	92.31	85.19
50	1	1	2	5.0	0.3	5.3	11.03	3.85	9.88	74.26	84.62	75.93
48	8	0	8	4.0	0.7	4.7	8.82	7.69	8.64	63.24	80.77	66.05
46	3	1	4	6.0	0.7	6.7	13.24	7.69	12.35	54.41	73.08	57.41
44	7	1	8	5.0	0.7	5.7	11.03	7.69	10.49	41.18	65.38	45.06
42	5	0	5	5.7	0.7	6.3	12.50	7.69	11.73	30.15	57.69	34.57
40	5	1	6	4.3	1.0	5.3	9.56	11.54	9.88	17.65	50.00	22.84
38	3	2	5	2.7	1.0	3.7	5.63	11.54	6.79	8.09	38.46	12.96
36	0	0	0	1.0	0.7	1.7	2.21	7.69	3.09	2.21	26.92	6.17
34	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	19.23	3.09
32	0	0	0	0.0	0.3	0.3	0.0	3.85	0.62	0.00	19.23	3.09
30	0	1	1	0.0	0.7	0.7	0.0	7.69	1.23	0.00	15.39	2.47
28	0	1	1	0.0	0.7	0.7	0.0	7.69	1.23	0.00	7.69	1.23

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	52.2	45.3	39.4	46.6	1.6	5.4	1.1
TRUCKS	50.1	40.0	29.9	41.5	5.3	7.9	3.7
COMBINED	52.0	44.8	38.4	45.8	1.7	6.2	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

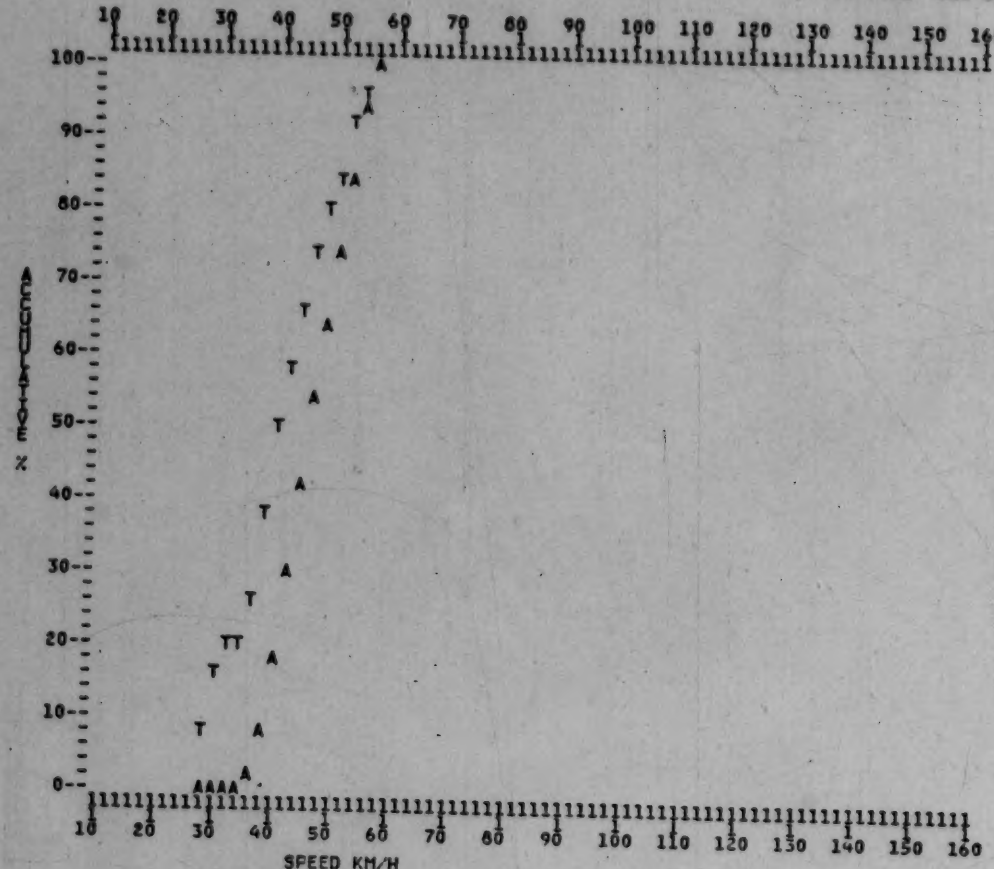
ALBERTA DEPARTMENT OF TRANSPO[illegible]ION
TRANSPORTATION SAFETY BR[illegible]CH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION SE RAMP .1 KM EAST OF 50TH ST TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 165 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 46
TRUCKS 60 KM/H TRUCKS 9

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 8 0 STOP TIME 820 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPO. ION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 20/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION SE RAMP .2 KM EAST OF 50TH ST TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 136 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 48
TRUCKS 60 KM/H TRUCKS 9

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 825 STOP TIME 850 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
80	1	0	1	0.3	0.0	0.3	0.70	0.0	0.59	100.00	100.00	100.00
78	0	0	0	0.3	0.0	0.3	0.70	0.0	0.59	99.30	100.00	99.41
76	0	0	0	0.7	0.0	0.7	1.40	0.0	1.18	98.60	100.00	98.82
74	2	0	2	1.3	0.0	1.3	2.80	0.0	2.37	97.20	100.00	97.63
72	2	0	2	1.3	0.0	1.3	2.80	0.0	2.37	94.41	100.00	95.27
70	0	0	0	1.0	0.0	1.0	2.10	0.0	1.78	91.61	100.00	92.90
68	1	0	1	1.7	0.7	1.5	2.79	7.69	3.55	89.51	100.00	91.12
66	2	2	4	1.7	1.0	1.7	2.79	11.54	4.73	86.72	92.31	87.57
64	3	1	4	2.7	1.3	2.0	3.89	15.38	6.28	83.92	80.77	85.21
62	10	1	11	5.3	1.3	5.0	13.99	15.38	14.20	79.22	65.38	78.92
60	5	0	6	5.7	0.3	5.7	13.29	7.69	12.43	62.24	57.69	62.72
58	4	0	4	4.7	0.0	4.7	9.79	0.0	8.28	48.95	53.85	50.30
56	4	0	4	3.7	1.0	4.7	7.69	11.54	8.28	34.96	53.85	37.87
54	3	3	6	3.7	1.0	3.7	5.59	11.54	6.51	25.17	53.85	29.59
52	1	0	1	3.7	1.0	3.7	4.90	11.54	5.92	17.48	42.31	21.30
50	1	0	1	2.3	1.0	2.3	2.80	0.0	2.37	11.89	30.77	14.79
48	0	0	0	1.3	0.0	1.3	2.80	3.85	2.96	6.99	19.23	8.88
46	1	1	2	0.3	0.3	1.7	0.70	7.69	1.78	4.20	15.38	5.92
44	0	1	1	0.3	0.7	1.0	0.70	7.69	1.78	1.40	7.69	1.78

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	66.4	60.2	53.1	61.1	1.9	6.7	1.3
TRUCKS	64.7	55.3	45.9	57.2	5.1	7.6	3.6
COMBINED	66.0	60.0	52.1	60.5	1.8	7.0	1.3

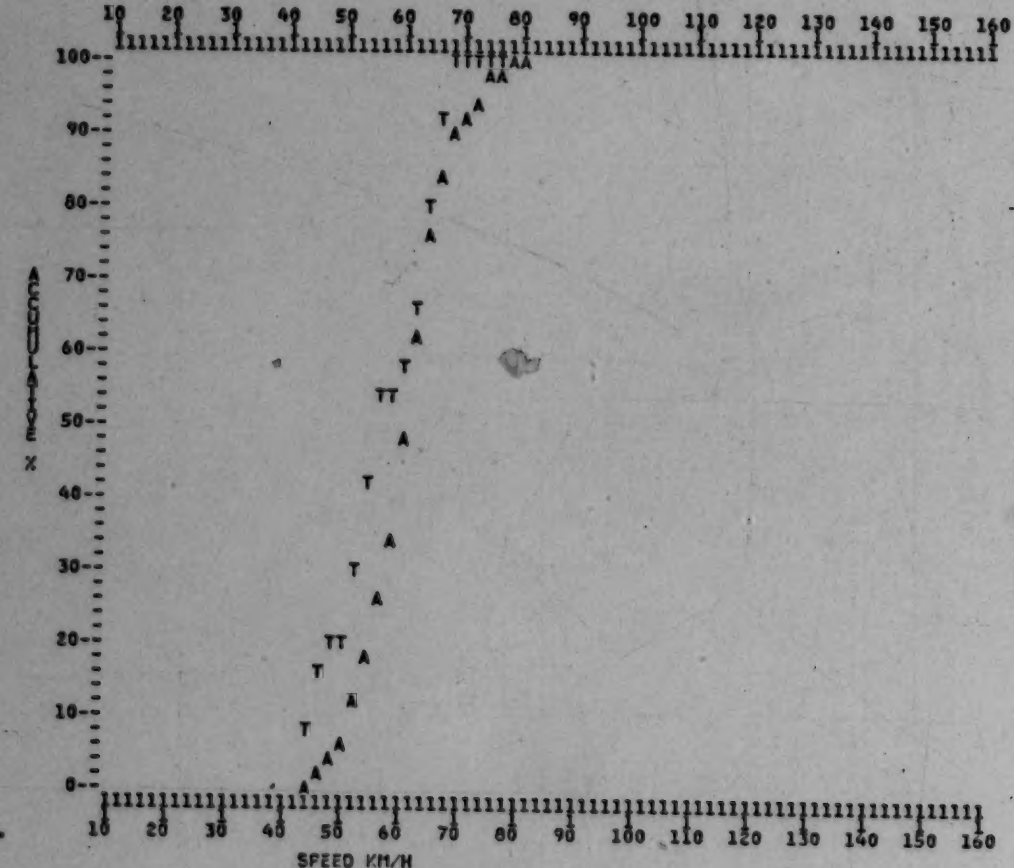
RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

ALBERTA DEPARTMENT OF TRANSI ATION
TRANSPORTATION SAFETY [illegible]NCH
SPEED STUDY ANALYSIS

HIGHWAY 14 LOCATION SE RAMP .2 KM EAST OF 50TH ST TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 136 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 48
TRUCKS 60 KM/H TRUCKS 9

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 825 STOP TIME 850 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

50 ST

ALBERTA DEPARTMENT OF TRANSPO ION
TRANSPORTATION SAFETY BR..CH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION .1KM E 50 ST & SE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 132 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 84 TRUCKS 15

DATE 20 5 80 LIGHT CONDITIONS-- DAY START TIME 945 STOP TIME 1030 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
68	2	0	2	1.0	0.0	1.0	1.20	0.0	1.02	100.00	100.00	100.00
66	1	0	1	1.7	0.0	1.7	1.00	0.0	1.70	98.80	100.00	98.98
64	3	0	3	3.7	0.0	3.7	3.20	0.0	3.72	96.80	100.00	97.28
62	4	0	4	5.0	0.0	5.0	4.40	0.0	3.74	93.60	100.00	94.59
60	6	0	6	6.3	0.0	6.3	6.00	0.0	5.10	89.20	100.00	90.87
58	6	0	6	8.3	0.0	8.3	7.60	0.0	6.46	83.20	100.00	85.71
56	9	0	9	9.7	0.0	9.7	10.00	2.27	9.84	75.60	100.00	79.25
54	10	1	11	9.7	1.3	11.0	11.60	9.09	11.22	65.60	97.73	70.41
52	10	1	11	10.0	1.7	11.7	12.00	11.36	11.20	54.00	88.64	59.18
50	10	1	11	10.0	1.3	11.3	12.00	9.09	11.56	42.00	77.27	47.26
48	10	0	10	8.3	0.7	9.0	10.00	4.55	9.18	30.00	68.18	35.71
46	5	1	6	6.0	0.7	6.7	7.20	4.55	6.80	20.00	63.64	26.53
44	3	1	4	5.7	0.0	5.7	4.40	13.64	5.78	12.80	59.09	18.75
42	3	1	4	5.0	0.0	5.0	3.60	13.64	5.10	8.40	45.45	13.95
40	2	1	3	4.3	1.7	4.3	2.80	11.36	4.08	4.80	31.82	8.84
38	1	0	1	2.3	1.0	2.3	1.60	9.82	2.58	2.00	20.46	4.76
36	0	2	2	0.3	0.7	1.0	0.40	4.55	1.02	0.40	13.64	2.18
34	0	0	0	0.0	1.0	1.0	0.0	9.82	1.02	-0.00	9.09	1.16
32	0	1	1	0.0	0.3	0.3	0.0	2.27	0.34	-0.00	2.27	0.34

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	52.6	45.3	38.6	46.5	1.4	6.6	1.0
TRUCKS	45.4	36.7	30.4	38.5	3.3	6.4	2.3
COMBINED	51.8	44.5	36.4	45.3	1.4	7.2	1.0

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

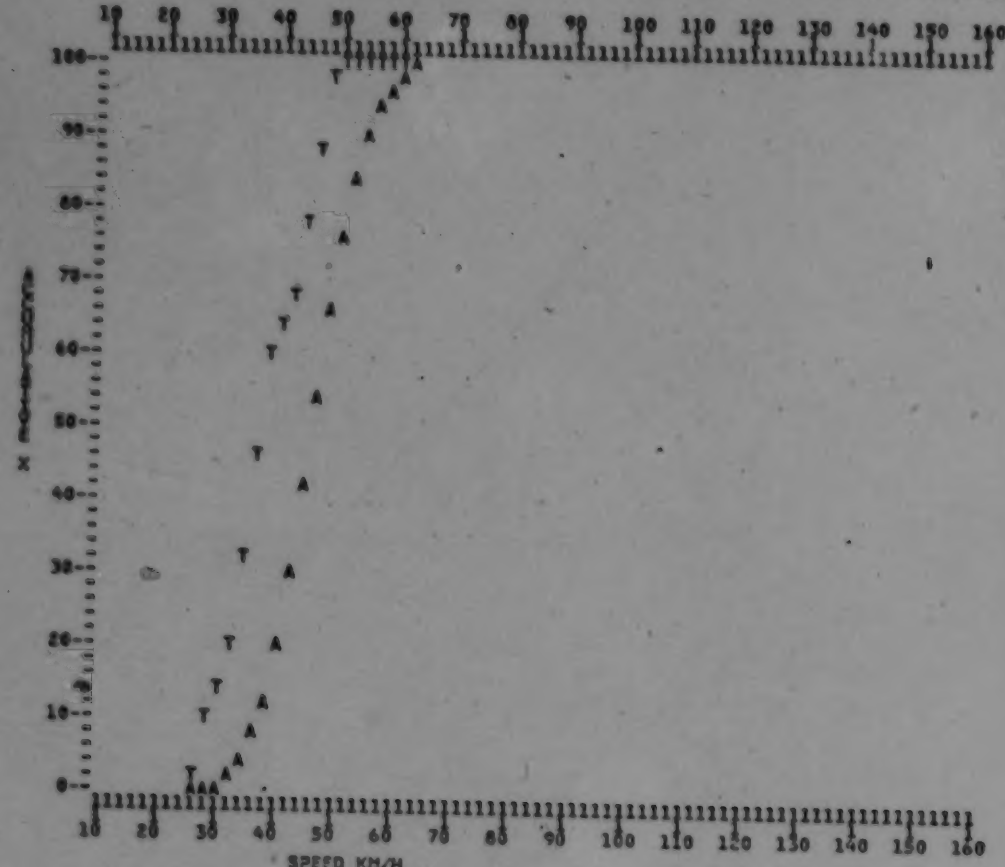
ALBERTA DEPARTMENT OF TRANSPO ION
TRANSPORTATION SAFETY B CH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION .1KM E 50 ST & SE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 132 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 84
TRUCKS 60 KM/H TRUCKS 13

DATE 28 5 80 LIGHT CONDITIONS-- DAY START TIME 945 STOP TIME 1030 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE X VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPO ION
TRANSPORTATION SAFETY B. CH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION .2KM E 50 ST SE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 134 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 84 TRUCKS 17

DATE 20 5 80 LIGHT CONDITIONS-- DAY START TIME 945 STOP TIME 1030 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
65	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	100.00	100.00	100.00
64	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	99.60	100.00	99.67
63	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	99.60	100.00	99.00
62	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	99.60	100.00	99.33
61	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	99.60	100.00	99.67
60	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	99.20	100.00	99.67
59	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	99.20	100.00	99.67
58	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	99.20	100.00	99.67
57	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	99.20	100.00	99.67
56	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	98.80	100.00	99.33
55	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	98.80	100.00	99.33
54	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	98.80	100.00	99.33
53	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	98.80	100.00	99.33
52	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	98.40	100.00	99.00
51	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	98.40	100.00	99.00
50	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	98.40	100.00	99.00
49	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	98.40	100.00	99.00
48	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	98.00	100.00	98.67
47	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	98.00	100.00	98.67
46	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	98.00	100.00	98.67
45	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	98.00	100.00	98.67
44	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	97.60	100.00	98.33
43	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	97.60	100.00	98.33
42	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	97.60	100.00	98.33
41	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	97.60	100.00	98.33
40	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	97.20	100.00	98.00
39	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	97.20	100.00	98.00
38	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	97.20	100.00	98.00
37	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	97.20	100.00	98.00
36	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	96.80	100.00	97.67
35	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	96.80	100.00	97.67
34	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	96.80	100.00	97.67
33	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	96.80	100.00	97.67
32	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	96.40	100.00	97.33
31	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	96.40	100.00	97.33
30	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	96.40	100.00	97.33
29	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	96.40	100.00	97.33
28	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	96.00	100.00	97.00
27	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	96.00	100.00	97.00
26	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	96.00	100.00	97.00
25	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	96.00	100.00	97.00
24	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	95.60	100.00	96.67
23	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	95.60	100.00	96.67
22	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	95.60	100.00	96.67
21	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	95.60	100.00	96.67
20	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	95.20	100.00	96.33
19	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	95.20	100.00	96.33
18	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	95.20	100.00	96.33
17	1	0	1	0.3	0.0	0.3	0.40	0.0	0.33	95.20	100.00	96.33
16	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	94.80	100.00	96.00
15	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	94.80	100.00	96.00
14	0	0	0	0.3	0.0	0.3	0.00	0.0	0.00	94.80	100.00	96.00
13	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	94.80	100.00	96.00
12	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	90.80	94.12	91.67
11	0	0	0	3.0	0.3	3.3	0.00	0.00	0.00	86.80	88.24	87.33
10	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	86.80	88.24	87.33
9	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	82.80	82.35	83.00
8	0	0	0	3.0	0.3	3.3	0.00	0.00	0.00	78.80	76.47	78.67
7	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	78.80	76.47	78.67
6	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	74.80	70.59	74.33
5	0	0	0	3.0	0.3	3.3	0.00	0.00	0.00	70.80	64.71	70.00
4	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	70.80	64.71	70.00
3	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	66.80	58.82	65.67
2	0	0	0	3.0	0.3	3.3	0.00	0.00	0.00	62.80	52.94	61.33
1	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	62.80	52.94	61.33
0	10	1	11	3.0	0.3	3.3	4.00	5.88	4.33	58.80	47.06	57.00

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	65.2	56.2	48.4	57.3	1.9	9.1	1.4
TRUCKS	57.4	49.7	38.8	49.6	3.8	7.9	2.7
COMBINED	63.7	55.3	46.0	56.8	1.8	9.3	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

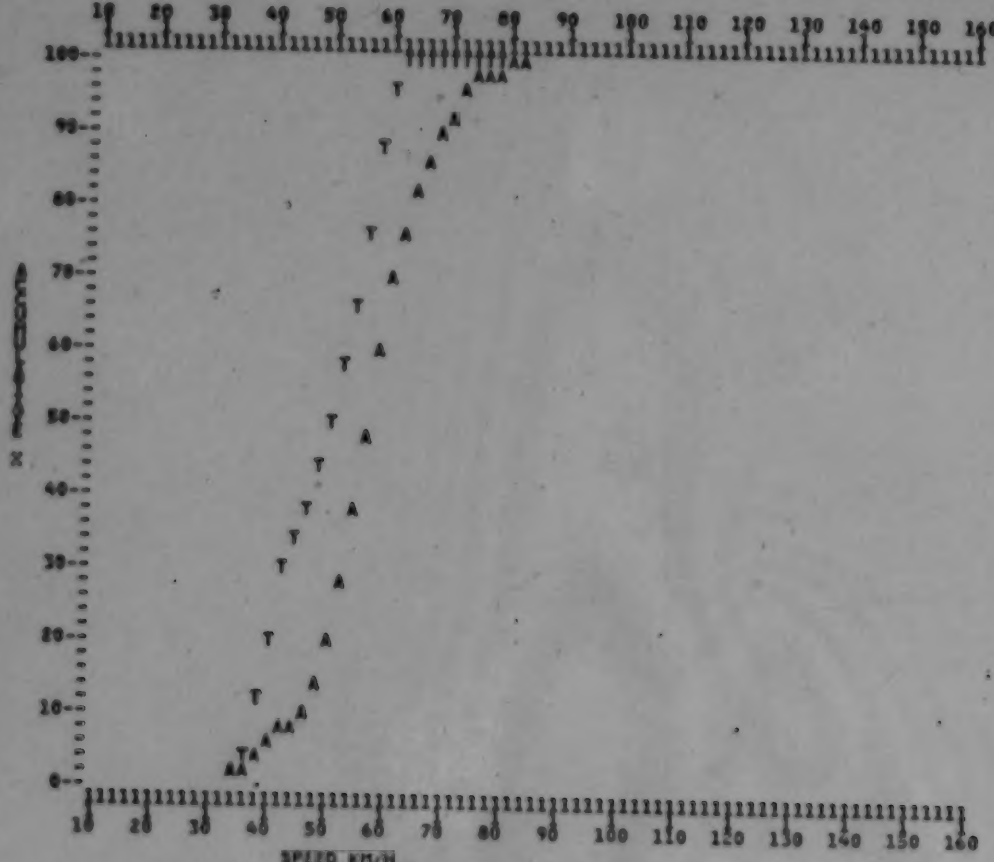
ALBERTA DEPARTMENT OF TRANSP[illegible]TION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION .2KM E 50 ST SE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 134 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 84 TRUCKS 17

DATE 29 5 80 LIGHT CONDITIONS-- DAY START TIME 945 STOP TIME 1030 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

APPENDIX 2

ENTRANCE TERMINAL 2

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26 80
STUDY NUMBER 6081

HIGHWAY 60 LOCATION 200M W EXIT TO HWY 16 N LANE TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 56 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 47 TRUCKS 11

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1245 STOP TIME 1345 DIRECTION OF TRAVEL W AADT 99999

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
96	1	0	1	0.7	0.0	0.7	1.44	0.0	1.16	100.00	100.00	100.00
94	1	0	1	0.7	0.0	0.7	1.44	0.0	1.16	98.56	100.00	98.84
92	0	0	0	0.3	0.0	0.3	0.72	0.0	0.58	97.12	100.00	97.67
90	0	0	0	0.3	0.0	0.3	0.72	0.0	0.58	96.40	100.00	97.09
88	1	0	1	0.7	0.0	0.7	1.44	0.0	1.16	95.68	100.00	96.51
86	1	0	1	1.3	0.0	1.3	1.44	0.0	1.16	94.24	100.00	95.35
84	2	0	2	1.3	0.0	1.3	2.88	0.0	2.33	92.80	100.00	94.19
82	1	0	1	1.0	0.3	1.3	1.44	0.0	1.16	91.37	100.00	93.02
80	0	0	0	1.0	0.3	1.3	0.72	0.0	0.58	89.93	100.00	91.86
78	3	0	3	1.3	0.3	1.3	4.32	3.03	4.07	89.21	100.00	91.28
76	2	1	3	2.7	0.7	3.3	2.88	3.03	2.91	84.89	100.00	87.21
74	5	1	6	5.0	1.0	5.3	7.19	6.06	6.98	82.01	96.97	84.30
72	7	1	8	6.3	1.0	7.3	10.79	6.06	9.88	74.82	90.91	77.33
70	6	1	7	5.3	1.0	7.3	11.67	9.09	12.79	64.03	84.85	67.44
68	3	1	4	5.3	1.7	7.0	4.32	9.09	5.23	52.34	75.76	54.65
66	1	1	2	3.7	1.7	5.0	1.51	15.15	3.49	48.02	66.67	49.42
64	1	1	2	1.7	1.0	2.7	1.44	15.15	3.49	46.58	51.52	45.93
62	1	0	1	1.0	0.7	2.0	1.44	18.18	4.65	45.14	36.36	42.44
60	1	0	1	1.0	0.7	2.0	1.44	9.09	3.49	43.70	18.18	39.77
58	1	0	1	1.7	0.7	1.7	1.44	6.06	2.91	42.26	9.09	38.37
56	1	0	1	1.7	0.0	1.7	1.44	0.0	1.16	40.82	3.03	36.63
54	0	0	0	0.3	0.0	0.3	0.72	0.0	0.58	39.38	3.03	35.47
52	0	0	0	0.3	0.0	0.3	0.72	0.0	0.58	38.66	3.03	34.88
50	1	0	1	0.3	0.0	0.3	0.72	0.0	0.58	37.94	3.03	34.30

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	79.1	71.6	62.6	72.5	2.5	8.8	1.8
TRUCKS	75.0	68.2	64.0	70.0	3.0	5.1	2.1
COMBINED	77.8	71.0	63.3	72.0	2.1	8.2	1.5

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

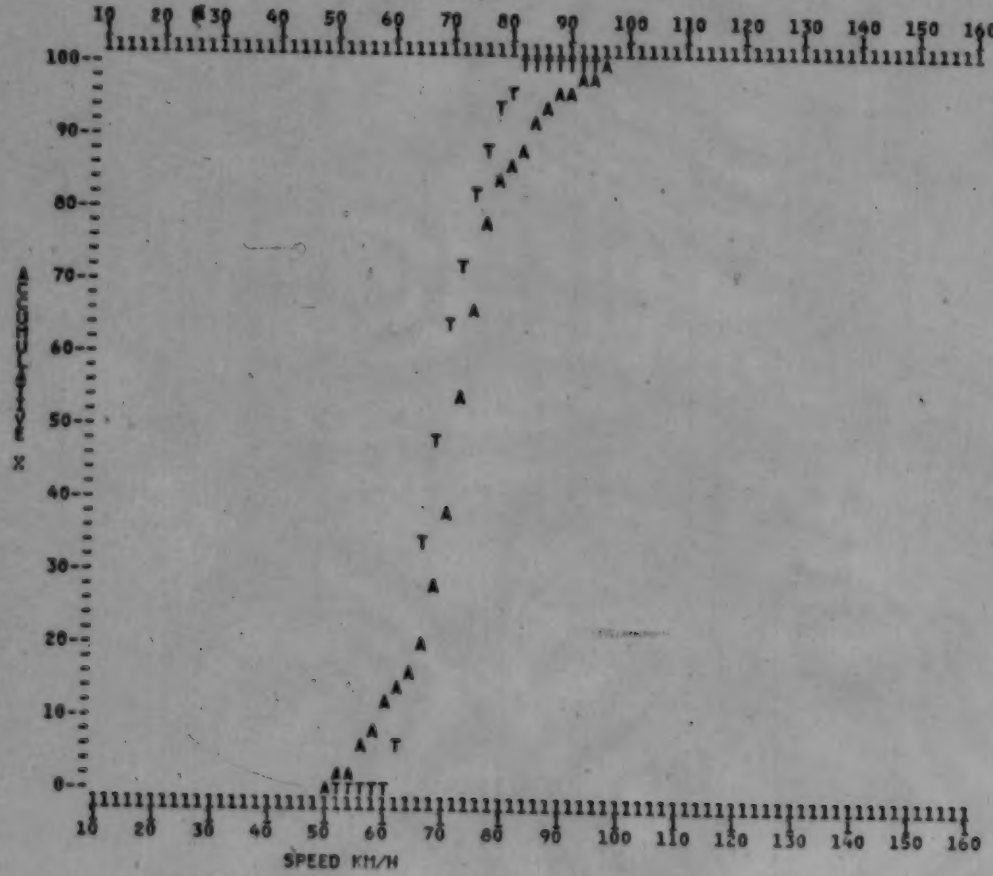
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6001

HIGHWAY 60 LOCATION 200M W EXIT TO HWY 16 N LANE TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 58 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 47 TRUCKS 11

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1245 STOP TIME 1345 DIRECTION OF TRAVEL W AADT 99999



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6011

HIGHWAY 60 LOCATION 12SM W BND N RAMP S LANE TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 70 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 50 TRUCKS 9

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1435 STOP TIME 1525 DIRECTION OF TRAVEL W AADT 99999

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
70	1	0	1	0.3	0.0	0.3	0.68	0.0	0.57	100.00	100.00	100.00
66	0	0	0	0.3	0.0	0.3	0.68	0.0	0.57	99.32	100.00	99.43
64	0	0	0	0.3	0.0	0.3	0.0	0.0	0.0	98.65	100.00	98.86
62	0	0	0	0.3	0.0	0.3	0.68	0.0	0.57	98.65	100.00	98.86
60	1	0	1	0.3	0.0	0.3	0.68	0.0	0.57	97.97	100.00	98.29
58	1	0	1	0.3	0.0	0.3	0.68	0.0	0.57	97.30	100.00	97.71
56	2	0	2	0.3	0.0	0.3	1.35	0.0	1.14	96.62	100.00	97.14
54	4	0	4	0.3	0.2	0.5	2.70	2.70	2.86	94.59	100.00	95.43
52	5	0	5	0.7	0.2	0.9	3.41	2.41	3.71	91.89	97.30	92.57
50	9	0	9	0.7	0.2	0.9	6.46	2.41	6.14	88.49	94.59	88.86
48	9	0	9	0.7	0.2	0.9	12.24	3.70	11.43	82.03	92.30	82.71
46	6	0	6	2.0	0.3	2.0	14.19	0.0	12.00	69.79	88.89	71.43
44	8	0	8	2.0	0.3	2.0	11.49	3.70	10.29	55.60	88.89	59.43
42	4	0	4	2.0	0.3	2.0	10.14	3.70	9.14	44.11	85.19	49.14
40	3	0	3	2.0	0.3	2.0	10.81	14.81	11.43	33.78	81.48	40.00
38	2	1	3	2.0	2.0	2.0	6.76	22.22	10.86	22.97	66.67	28.57
36	1	0	1	1.0	1.0	2.0	2.03	11.11	3.43	2.03	11.11	3.43

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	53.7	48.0	41.4	49.8	1.7	6.0	1.2
TRUCKS	52.9	41.5	36.3	44.7	3.9	6.0	2.8
COMBINED	53.6	47.2	40.4	48.3	1.6	6.2	1.1

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

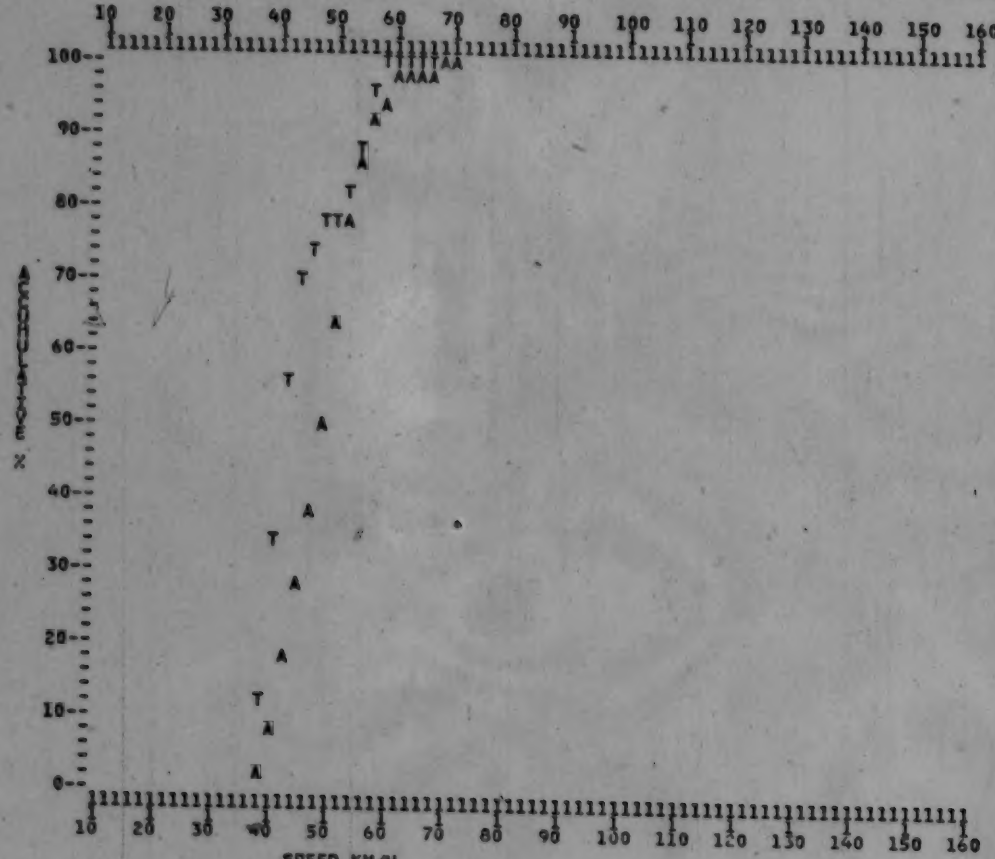
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6011

HIGHWAY 60 LOCATION 125M W BND N RAMP S LANE TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 70 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 50 TRUCKS 9

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1435 STOP TIME 1525 DIRECTION OF TRAVEL W AADT 99999



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6021

HIGHWAY 60 LOCATION 350M S.W. OF EXIT TO HWY 16 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 144 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 44 TRUCKS 16

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1355 STOP TIME 1420 DIRECTION OF TRAVEL W AADT 99999

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
94	1	0	1	0.7	0.0	0.7	1.55	0.0	1.13	100.00	100.00	100.00
92	0	0	0	0.7	0.0	0.7	1.55	0.0	1.13	98.45	100.00	98.87
90	0	0	0	0.7	0.0	0.7	1.55	0.0	1.13	96.90	100.00	97.74
88	1	0	1	0.7	0.0	0.7	1.55	0.0	1.13	95.35	100.00	96.61
86	1	0	1	1.0	0.3	1.3	1.55	2.08	2.26	93.80	100.00	95.48
84	1	1	2	1.7	0.7	2.3	1.55	4.17	2.95	91.47	97.92	93.22
82	2	1	3	2.3	1.0	3.3	3.10	6.25	3.95	87.60	93.75	89.59
80	1	1	2	2.0	1.0	3.0	2.33	6.25	3.39	84.50	87.50	85.31
78	0	1	1	2.0	1.0	3.0	2.33	6.25	3.39	82.17	81.25	81.92
76	0	1	1	2.7	1.0	3.7	2.33	6.25	3.39	79.84	75.00	78.53
74	0	1	1	4.0	1.7	5.7	2.33	6.25	3.39	77.51	68.75	75.14
72	0	2	2	5.0	2.0	7.0	4.65	12.50	6.21	75.18	62.50	71.75
70	0	2	2	4.3	2.0	6.3	9.30	8.33	9.04	70.53	50.00	65.54
68	2	0	2	3.0	1.3	4.3	13.95	10.42	12.99	66.67	41.67	59.32
66	1	0	1	2.3	0.7	3.0	7.75	12.50	8.04	52.71	31.25	46.33
64	1	1	2	3.0	0.7	3.7	10.03	8.33	9.60	44.96	18.75	38.28
62	0	1	1	3.0	0.7	3.7	6.88	4.17	6.21	34.88	10.42	28.67
60	0	0	0	2.7	0.7	3.3	9.30	2.08	7.34	27.91	6.25	22.46
58	0	0	0	2.0	0.7	2.7	3.88	4.17	3.95	18.60	4.17	15.25
56	0	0	0	1.7	0.7	2.3	2.33	4.17	2.82	14.73	0.00	11.30
54	0	1	1	1.3	0.3	1.7	0.78	2.08	1.13	12.40	0.00	8.47
52	0	0	0	0.7	0.3	1.0	0.78	2.08	1.13	11.63	0.00	7.34
50	1	0	1	1.0	0.7	1.7	2.33	6.25	3.39	10.85	0.00	6.21
48	0	0	0	0.3	0.0	0.3	0.78	0.0	0.56	8.53	0.00	2.82
46	0	0	0	0.3	0.0	0.3	0.78	0.0	0.56	7.75	0.00	2.26
44	2	0	2	0.7	0.0	0.7	1.55	0.0	1.13	6.98	0.00	1.69
										4.65	0.00	1.13
										3.10	0.00	0.56
										1.55	0.00	0.00

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	80.3	71.3	62.1	71.4	3.1	10.2	2.2
TRUCKS	79.2	71.0	55.5	70.1	4.6	9.5	3.3
COMBINED	79.8	71.2	60.2	71.1	2.6	10.0	1.8

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

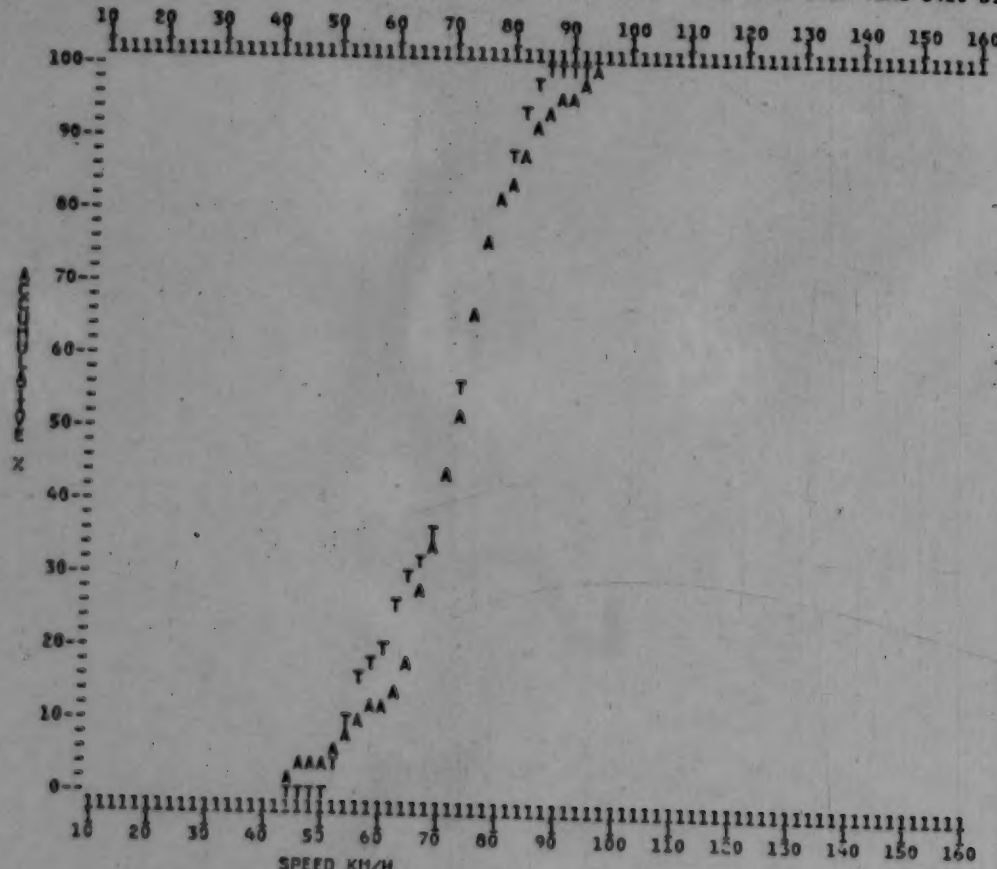
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6021

HIGHWAY 60 LOCATION 350M S.W. OF EXIT TO HWY 16 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 144 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H SAMPLE SIZE AUTOS 44
TRUCKS 90 KM/H TRUCKS 16

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1355 STOP TIME 1420 DIRECTION OF TRAVEL W AADT 99999



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6031

HIGHWAY 60 LOCATION 625M S.W. OF EXIT TO HWY. 16 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 42 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 42 TRUCKS 15

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1535 STOP TIME 1655 DIRECTION OF TRAVEL W AADT 99999

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
100	1	0	1	0.3	0.0	0.3	0.81	0.0	0.59	100.00	100.00	100.00
98	0	0	0	1.4	0.0	1.1	4.02	0.0	2.96	99.19	100.00	99.41
96	4	0	4	3.3	0.0	2.9	5.65	0.0	4.14	95.16	100.00	96.45
94	3	0	3	5.0	0.0	4.0	7.26	0.0	5.33	89.52	100.00	92.31
92	4	0	4	5.2	0.0	5.7	5.65	0.0	4.14	82.26	100.00	85.98
90	4	0	4	5.7	0.0	5.7	6.45	0.0	4.73	76.61	100.00	81.84
88	4	0	4	5.0	0.0	5.7	6.45	0.0	4.73	70.16	100.00	77.11
86	3	0	3	5.7	0.3	5.7	7.23	5.22	5.62	63.71	100.00	73.37
84	3	0	3	5.0	0.3	5.0	4.03	5.55	3.55	56.45	97.78	67.45
82	3	1	4	5.7	1.1	5.7	4.84	11.11	6.51	52.42	95.56	63.91
80	2	1	3	5.3	1.7	4.7	6.45	13.33	8.28	47.58	84.44	57.40
78	2	1	3	5.3	1.7	5.7	8.09	15.56	10.65	41.13	71.11	49.11
76	2	1	3	5.3	1.0	4.0	7.23	6.67	7.10	33.06	55.55	39.05
74	2	0	2	1.7	0.7	2.3	4.03	4.44	4.14	25.81	48.89	31.95
72	1	1	2	1.7	1.3	3.0	4.03	6.89	5.33	21.77	44.44	27.81
70	1	1	2	1.7	1.7	3.0	3.23	11.11	5.33	17.74	35.56	22.49
68	1	0	1	1.3	1.7	2.7	3.23	8.89	4.73	14.52	24.44	17.16
66	1	0	1	1.3	1.0	2.3	3.23	6.67	4.14	11.29	15.55	12.43
64	1	0	1	1.3	0.7	2.0	3.23	4.44	3.55	8.06	8.89	8.28
62	0	0	0	1.0	0.7	1.7	2.42	4.44	2.96	4.84	4.45	4.73
60	0	0	0	0.7	0.0	0.7	1.61	0.0	1.18	2.42	0.00	1.78
58	1	0	1	0.3	0.0	0.3	0.81	0.0	0.59	0.81	0.00	0.59

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	92.8	81.0	68.3	81.7	3.2	10.5	2.3
TRUCKS	80.1	74.3	65.8	74.3	3.2	6.4	2.3
COMBINED	91.0	73.2	67.1	79.7	2.6	10.1	1.9

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

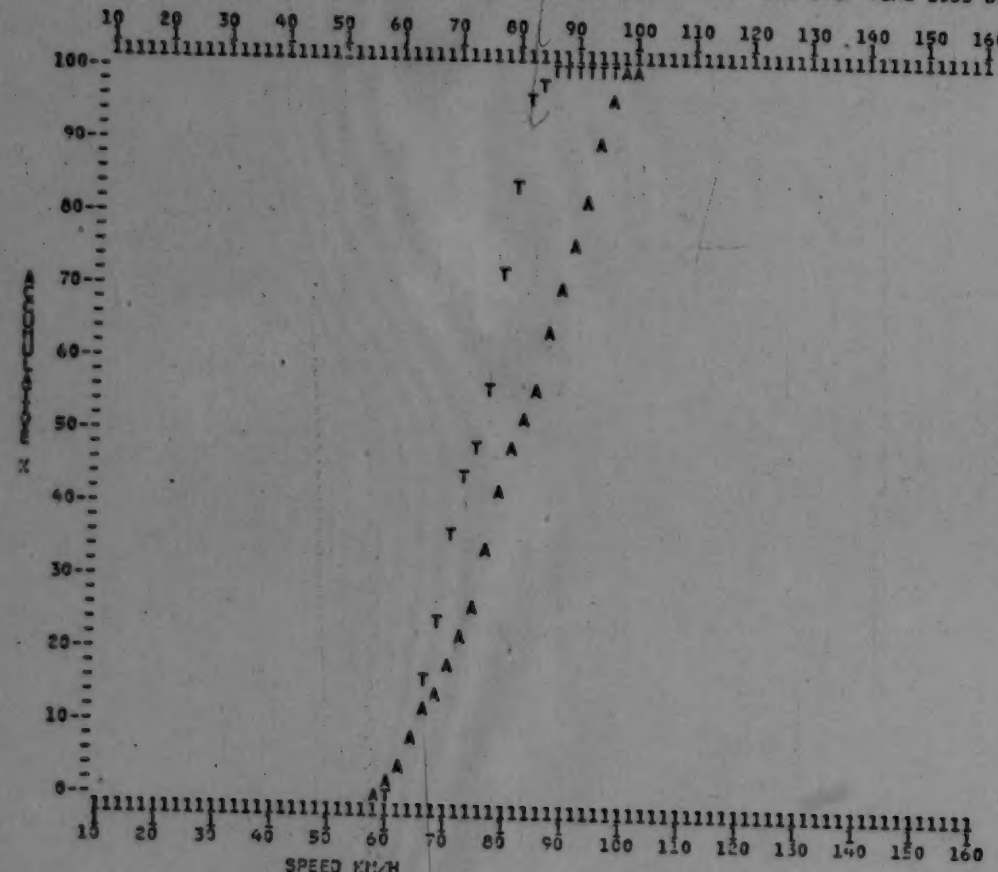
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6031

HIGHWAY 60 LOCATION 625M S.W. OF EXIT TO HWY. 16 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 42 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H
TRUCKS 90 KM/H
SAMPLE SIZE AUTOS 42
TRUCKS 15

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1535 STOP TIME 1655 DIRECTION OF TRAVEL W AADT 99999



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6001

HIGHWAY 60 LOCATION 200M W EXIT TO HWY 16 N LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 138 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 63 TRUCKS 6

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1530 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
90	3	0	3	1.7	0.0	1.7	2.70	0.0	2.46	100.00	100.00	100.00
88	3	0	3	1.7	0.0	1.7	3.78	0.0	3.45	97.30	100.00	97.54
86	5	0	5	3.0	0.0	3.0	4.86	0.0	4.43	93.51	100.00	94.09
84	5	0	5	4.0	0.0	4.0	6.49	0.0	5.91	88.65	100.00	89.66
82	5	0	5	4.7	0.0	4.7	7.57	0.0	6.90	82.16	100.00	83.74
80	4	0	4	3.0	0.3	3.3	4.86	5.56	5.93	74.59	100.00	76.85
78	0	1	1	2.3	0.3	2.7	3.78	5.56	4.93	69.73	94.44	71.92
76	3	1	4	2.7	0.7	3.3	4.32	11.11	7.39	65.95	88.89	67.98
74	5	1	6	4.7	0.7	5.3	7.57	11.11	8.87	61.62	77.78	63.05
72	3	1	4	6.7	1.3	8.0	10.81	22.22	14.78	54.05	66.67	55.17
70	6	1	7	6.7	1.0	7.7	10.81	16.67	13.30	43.24	44.45	43.35
68	5	1	6	8.0	1.0	9.0	12.97	16.67	14.32	32.43	27.78	32.02
66	10	1	11	5.3	0.3	5.7	8.65	5.55	8.37	19.46	11.11	18.72
64	2	0	2	3.7	0.3	4.0	5.95	5.55	5.91	10.81	5.55	10.34
62	0	0	0	0.7	0.0	0.7	1.08	0.0	0.99	4.86	0.00	4.43
60	1	0	1	0.7	0.0	0.7	1.08	0.0	0.99	3.78	0.00	3.45
58	1	0	1	0.7	0.0	0.7	1.08	0.0	0.99	2.70	0.00	2.46
56	0	0	0	0.7	0.0	0.7	1.08	0.0	0.99	1.62	0.00	1.48
54	1	0	1	0.3	0.0	0.3	0.54	0.0	0.49	0.54	0.00	0.49

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	82.9	71.3	65.0	73.9	2.0	8.1	1.4
TRUCKS	75.3	70.5	66.5	71.7	3.3	4.1	2.3
COMBINED	82.4	71.1	65.1	73.7	1.9	7.9	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

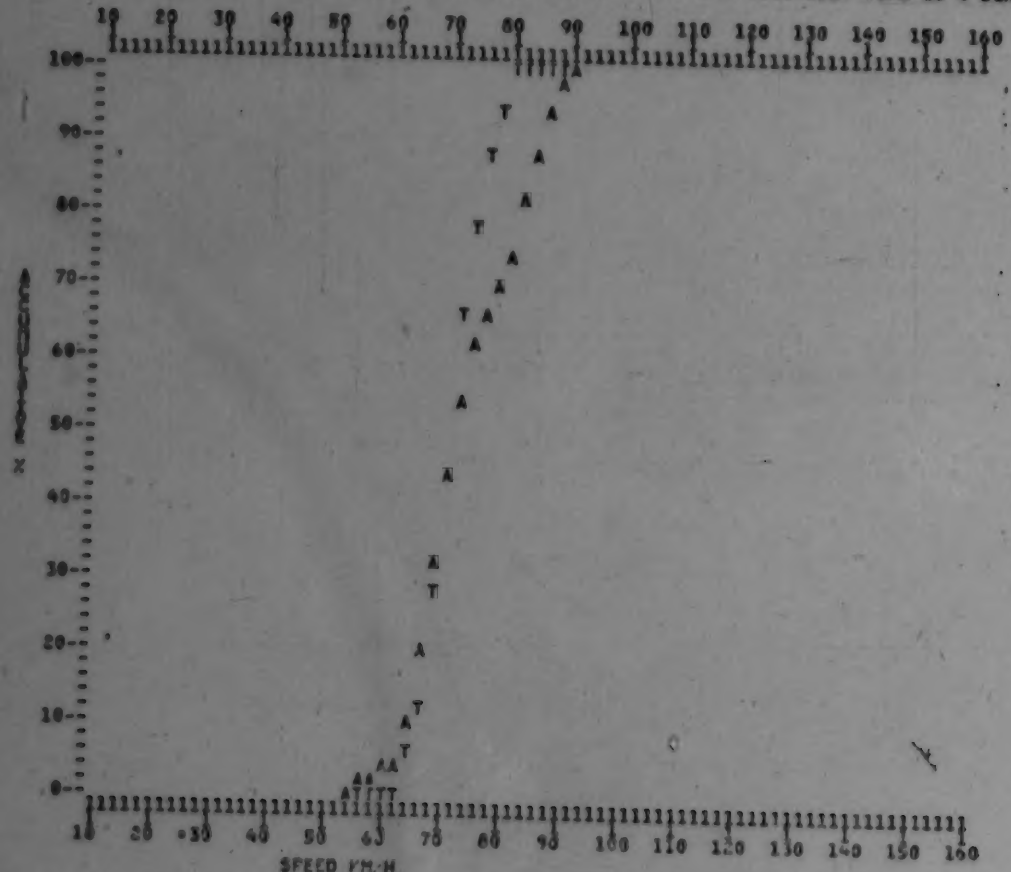
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6001

HIGHWAY 60 LOCATION 200M W EXIT TO HWY 16 N LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 138 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 63 TRUCKS 6

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1530 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED

A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6011

HIGHWAY 60 LOCATION 125M W BND N RAMP S LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 56 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 19 TRUCKS 9

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1530 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
68	1	0	1	1.3	0.0	1.3	7.27	0.0	4.94	100.00	100.00	100.00
66	2	0	2	2.0	0.0	3.0	10.91	0.0	7.41	92.73	100.00	95.06
64	2	0	2	2.0	0.0	3.0	10.91	0.0	7.41	81.82	100.00	87.65
62	1	0	1	1.3	0.0	1.3	7.27	0.0	4.94	70.91	100.00	80.25
60	1	0	1	1.0	0.0	1.0	5.45	0.0	3.70	63.64	100.00	75.31
58	1	0	1	1.7	1.0	3.7	9.09	11.54	9.88	58.18	100.00	71.60
56	3	1	4	3.3	1.0	5.3	12.73	11.54	12.35	49.09	88.46	61.73
54	3	0	3	2.3	1.3	4.7	16.36	22.92	17.28	36.36	76.92	49.38
52	1	1	2	1.7	1.3	3.0	5.09	15.38	11.11	23.64	50.00	32.10
50	1	0	1	1.0	1.7	3.7	5.45	19.23	9.88	14.55	34.62	20.99
48	1	1	2	0.7	0.3	1.0	3.64	3.85	3.70	9.09	15.38	11.11
46	0	0	0	0.3	0.3	0.7	1.82	3.85	2.47	5.45	11.54	7.41
44	0	0	0	0.3	0.3	0.7	1.82	3.85	2.47	3.64	7.69	4.94
42	1	1	2	0.3	0.3	0.7	1.82	3.85	2.47	1.82	3.85	2.47

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	64.6	56.2	50.1	57.8	3.0	6.6	2.1
TRUCKS	55.4	52.0	47.8	52.2	2.7	4.0	1.9
COMBINED	63.3	54.1	48.8	56.0	2.4	6.4	1.7

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

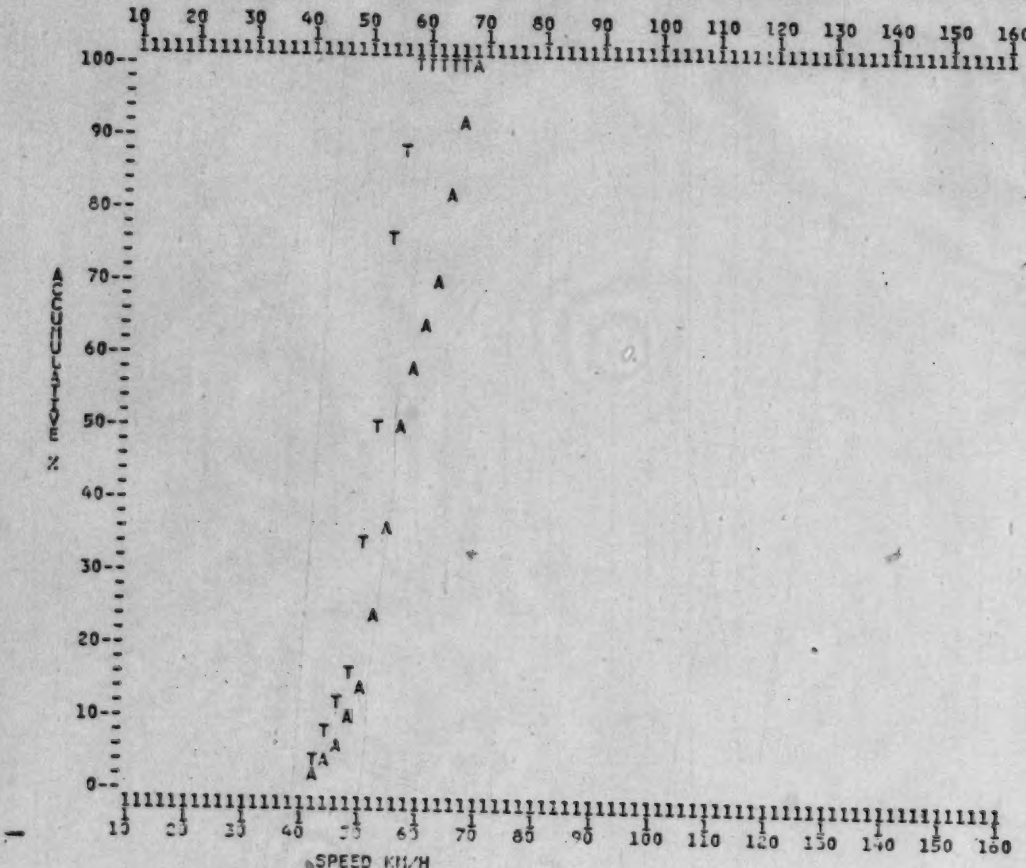
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6011

HIGHWAY 60 LOCATION 125M W BND N RAMP S LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 56 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 19 TRUCKS 9

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1530 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED

A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6021

HIGHWAY 60 LOCATION 350M S.W. OF EXIT TO HWY 16 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 196 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 63 TRUCKS 15

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1530 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
86	1	0	1	0.7	0.0	0.7	0.81	0.0	0.68	100.00	100.00	100.00
84	1	0	1	0.7	0.0	0.7	0.81	0.0	0.68	99.19	100.00	99.32
82	0	0	0	0.3	0.0	0.3	0.40	0.0	0.34	98.38	100.00	98.63
80	0	0	0	0.7	0.0	0.7	0.81	0.0	0.68	97.98	100.00	98.29
78	2	0	2	1.3	0.0	1.3	1.61	0.0	1.37	97.17	100.00	97.60
76	2	0	2	1.0	0.3	1.3	1.61	0.0	1.37	95.55	100.00	96.23
74	3	0	3	1.0	0.3	1.3	3.64	2.22	3.42	93.12	97.78	93.84
72	4	0	4	1.0	0.3	1.3	4.84	2.22	4.45	89.47	95.55	90.41
70	5	0	5	1.0	1.0	2.0	6.07	6.67	6.16	84.62	89.89	85.27
68	5	1	6	1.0	1.0	2.0	6.07	6.67	6.16	78.54	83.22	79.11
66	5	1	6	1.0	0.7	1.7	6.07	4.44	5.85	72.47	75.55	72.95
64	6	1	7	1.3	1.0	2.3	7.29	6.67	7.19	65.18	71.11	66.10
62	6	2	8	1.3	1.0	2.3	7.29	11.11	8.22	57.89	64.44	58.90
60	5	2	7	1.3	1.0	2.3	6.48	13.33	7.53	50.20	53.33	50.68
58	4	2	6	1.0	1.0	2.0	5.67	11.11	6.51	43.72	40.00	43.15
56	3	1	4	1.0	1.0	2.0	4.86	6.67	5.14	38.06	28.89	36.64
54	4	1	5	1.0	1.0	2.0	5.26	6.67	5.48	33.20	22.22	31.51
52	3	1	4	0.7	1.0	1.7	4.86	6.67	5.14	27.94	15.55	26.03
50	3	0	3	0.7	0.7	1.4	4.05	4.44	4.11	23.08	11.11	21.23
48	2	0	2	0.3	0.7	1.0	2.43	4.44	2.74	19.03	6.67	17.12
46	2	0	2	0.3	0.3	0.7	2.02	2.22	2.05	16.60	4.45	14.53
44	2	0	2	0.3	0.3	0.7	2.02	2.22	2.05	14.57	2.22	12.67
42	2	0	2	0.3	0.0	0.3	2.02	0.0	1.71	11.34	0.00	10.60
40	2	0	2	0.0	0.0	0.0	2.02	0.0	1.71	8.10	0.00	6.85
38	1	0	1	0.0	0.0	0.0	1.21	0.0	1.03	4.84	0.00	4.11
36	1	0	1	0.0	0.0	0.0	1.21	0.0	1.03	2.83	0.00	2.40
34	1	0	1	1.0	0.0	1.0	1.21	0.0	1.03	1.21	0.00	1.03

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	70.2	59.9	44.4	59.5	2.5	11.5	1.8
TRUCKS	68.8	59.5	51.7	60.8	3.8	7.6	2.7
COMBINED	69.9	59.8	46.2	59.7	2.2	11.0	1.5

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

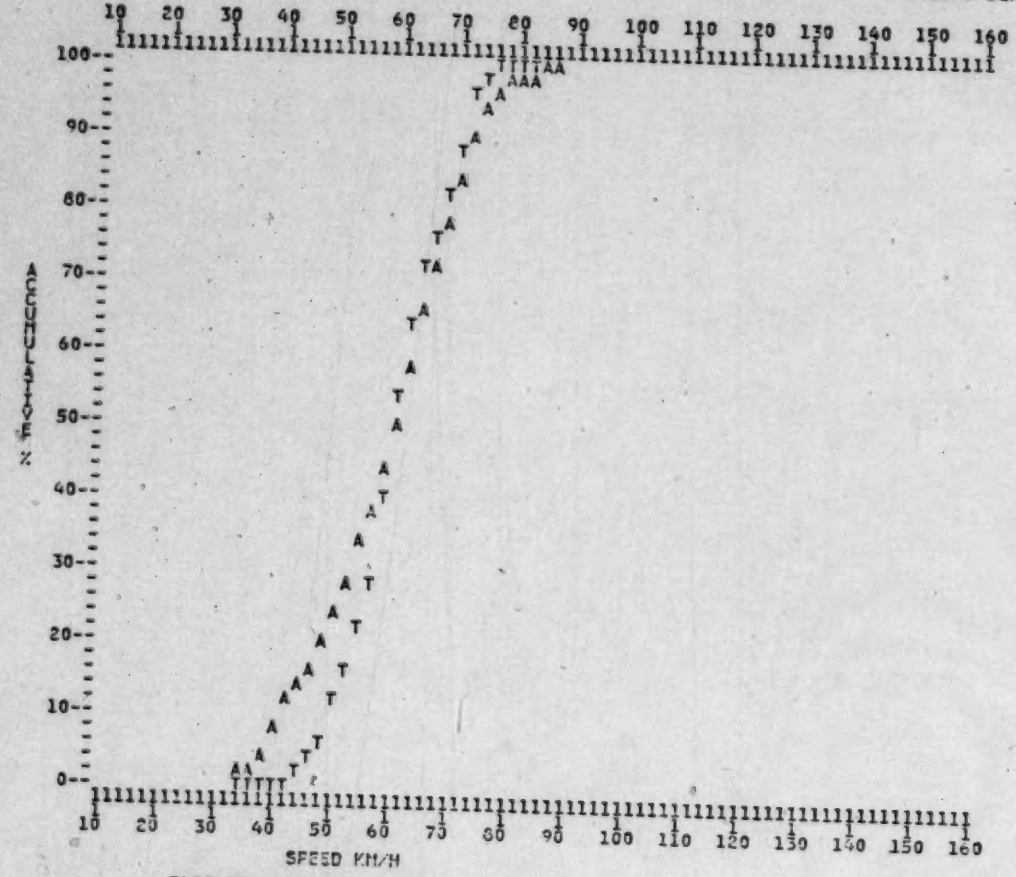
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6021

HIGHWAY 60 LOCATION 350M S.W. OF EXIT TO HWY 16 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 196 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 83 TRUCKS 15

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1530 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED

A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPL ,TION
TRANSPOPTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6031

HIGHWAY 60 LOCATION 625M S.W. OF EXI TO HWY. 16 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 194 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 82 TRUCKS 15

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1530 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
98	1	0	1	0.3	0.0	0.3	0.41	0.0	0.35	100.00	100.00	100.00
96	1	0	1	0.7	0.0	0.7	0.83	0.0	0.70	99.59	100.00	99.65
94	1	0	1	1.0	0.0	1.0	1.24	0.0	1.05	98.76	100.00	98.95
92	3	0	3	3.3	0.0	3.3	4.13	0.0	3.49	97.52	100.00	97.91
90	5	0	5	5.7	0.0	5.7	7.02	0.0	5.92	93.39	100.00	94.43
88	8	0	8	5.7	0.3	6.0	7.02	2.22	6.27	86.36	100.00	89.50
86	2	1	3	5.3	0.3	5.7	6.61	5.22	6.22	79.34	97.78	83.23
84	6	0	6	4.7	0.3	5.0	5.79	5.22	5.23	72.73	95.55	76.81
82	4	0	4	5.3	0.0	5.3	6.61	0.0	5.57	66.94	93.33	71.08
80	4	0	4	5.0	0.0	5.0	6.20	0.0	5.23	60.33	93.33	65.51
78	5	0	5	5.3	1.0	6.3	6.61	6.67	6.62	54.13	93.33	60.28
76	7	3	10	5.7	1.3	7.0	7.02	8.89	7.32	47.52	86.67	53.66
74	5	2	7	5.0	2.0	7.0	6.20	13.33	7.32	40.50	77.78	46.34
72	5	2	7	4.3	1.3	5.7	5.37	8.89	5.92	34.30	64.44	39.02
70	5	1	6	4.3	1.0	5.3	5.37	6.67	5.57	28.93	55.56	33.10
68	5	1	6	4.3	0.7	5.0	5.37	4.44	5.23	23.55	48.89	27.53
66	3	1	4	3.0	0.7	3.7	3.72	4.44	3.83	18.18	44.44	22.30
64	1	1	2	2.3	1.0	3.3	2.89	6.67	3.48	14.46	40.00	18.47
62	3	1	4	3.0	0.7	3.7	3.72	4.44	3.83	11.57	33.33	14.98
60	0	1	1	2.0	0.7	2.7	2.48	4.44	2.79	7.85	28.89	12.89
58	1	1	2	1.7	1.0	2.7	2.07	6.67	2.79	5.37	24.44	10.10
56	1	1	2	1.3	1.3	2.7	1.65	8.89	2.79	3.31	17.78	7.67
54	0	1	1	0.3	1.3	1.7	0.41	6.67	1.39	1.65	8.89	4.88
52	0	0	0	0.3	0.3	0.7	0.41	2.22	0.70	1.24	2.22	3.48
50	1	0	1	0.3	0.0	1.3	1.65	0.0	1.39	1.65	0.00	2.79
48	3	0	3	1.3	0.0	1.3	1.65	0.0	1.39	1.65	0.00	1.39

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	87.6	76.8	64.3	76.7	2.4	11.0	1.7
TRUCKS	75.6	68.3	55.4	67.9	4.7	9.2	3.3
COMBINED	86.9	75.0	62.0	75.3	2.3	11.2	1.6

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

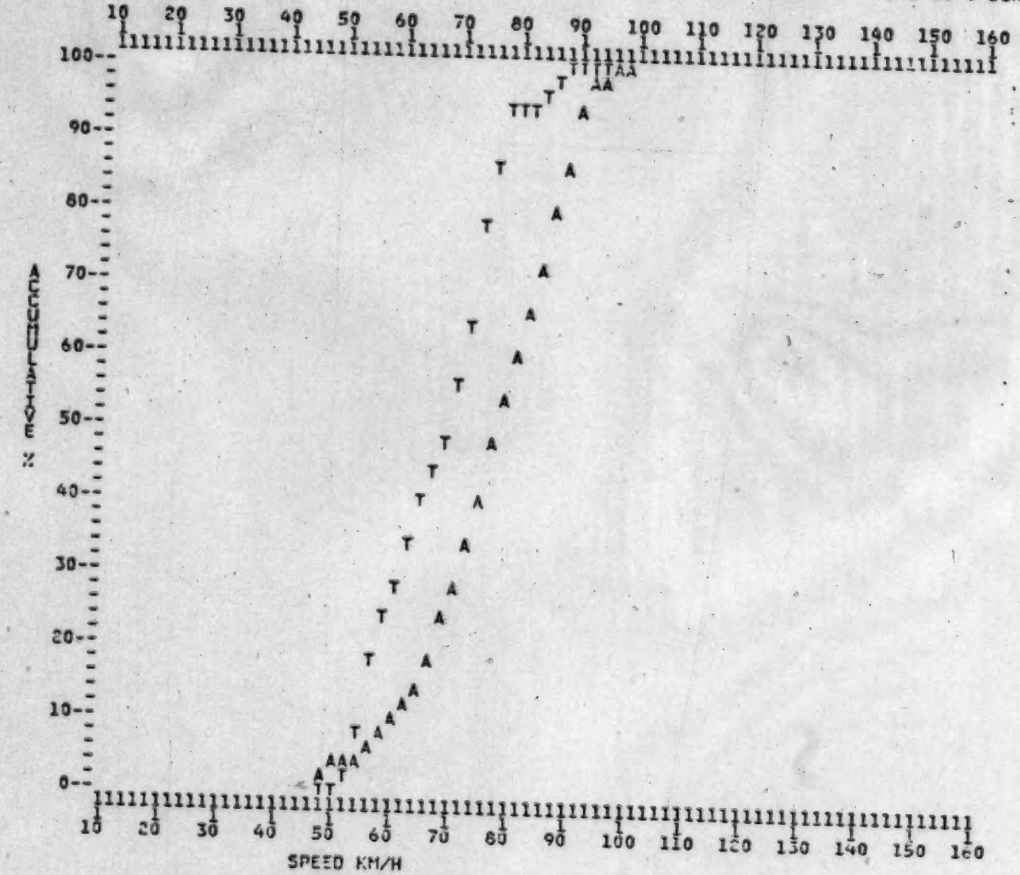
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 6031

HIGHWAY 60 LOCATION 625M S.W. OF EXI TO HWY. 16 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 194 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H
TRUCKS 90 KM/H
SAMPLE SIZE AUTOS 82
TRUCKS 15

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1530 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

APPENDIX 3

ENTRANCE TERMINAL 3

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1701

HIGHWAY 14 LOCATION HWY 14 N RMP N LNE 20M W 17ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 80 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 36 TRUCKS 24

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 10 5 STOP TIME 1050 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
70	1	0	1	0.3	0.0	0.3	0.94	0.0	0.56	100.00	100.00	100.00
68	0	0	0	0.3	0.0	0.3	0.94	0.0	0.56	99.06	100.00	99.44
66	0	0	0	0.3	0.0	0.3	0.94	0.0	0.56	98.11	100.00	98.87
64	0	1	1	2.0	0.3	2.3	5.66	1.41	3.95	97.17	100.00	98.31
62	3	1	4	3.0	1.0	4.0	8.49	4.23	6.78	91.51	98.59	94.35
60	3	1	4	3.7	1.0	4.7	10.38	4.23	7.91	83.02	94.37	87.57
58	3	2	5	3.7	2.0	5.7	10.38	8.45	9.60	72.64	90.14	79.66
56	3	1	4	3.0	2.7	5.7	8.49	11.27	9.60	62.26	81.69	70.06
54	4	1	5	3.3	4.0	7.3	9.43	14.80	12.43	53.77	70.42	60.45
52	4	2	6	3.3	2.7	6.0	9.43	12.68	10.73	44.34	53.52	49.02
50	5	1	6	3.3	2.7	6.0	9.43	11.27	10.17	34.91	40.85	38.29
48	1	3	4	2.3	2.7	4.0	6.60	7.04	6.78	25.47	29.58	28.12
46	1	1	2	1.0	1.3	2.3	2.83	5.63	3.95	18.87	22.54	21.47
44	1	0	1	0.7	0.7	1.3	1.89	2.82	2.26	16.04	16.90	16.74
42	1	1	2	1.0	0.7	1.7	2.83	2.82	2.82	14.15	14.08	14.12
40	2	0	2	1.3	1.0	2.3	5.67	2.82	4.52	11.32	11.27	11.30
38	1	0	1	1.0	0.7	1.7	2.77	2.82	2.82	5.65	8.45	6.78
36	0	1	1	1.0	0.7	1.7	2.83	2.82	2.82	2.83	5.63	3.95
34	1	1	2	0.3	0.3	0.7	0.94	1.41	1.13	0.94	1.41	1.13

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	60.5	53.2	42.9	53.3	2.6	8.0	1.9
TRUCKS	56.8	51.4	42.6	51.3	2.7	6.7	1.9
COMBINED	59.4	52.3	42.8	52.5	1.9	7.6	1.4

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

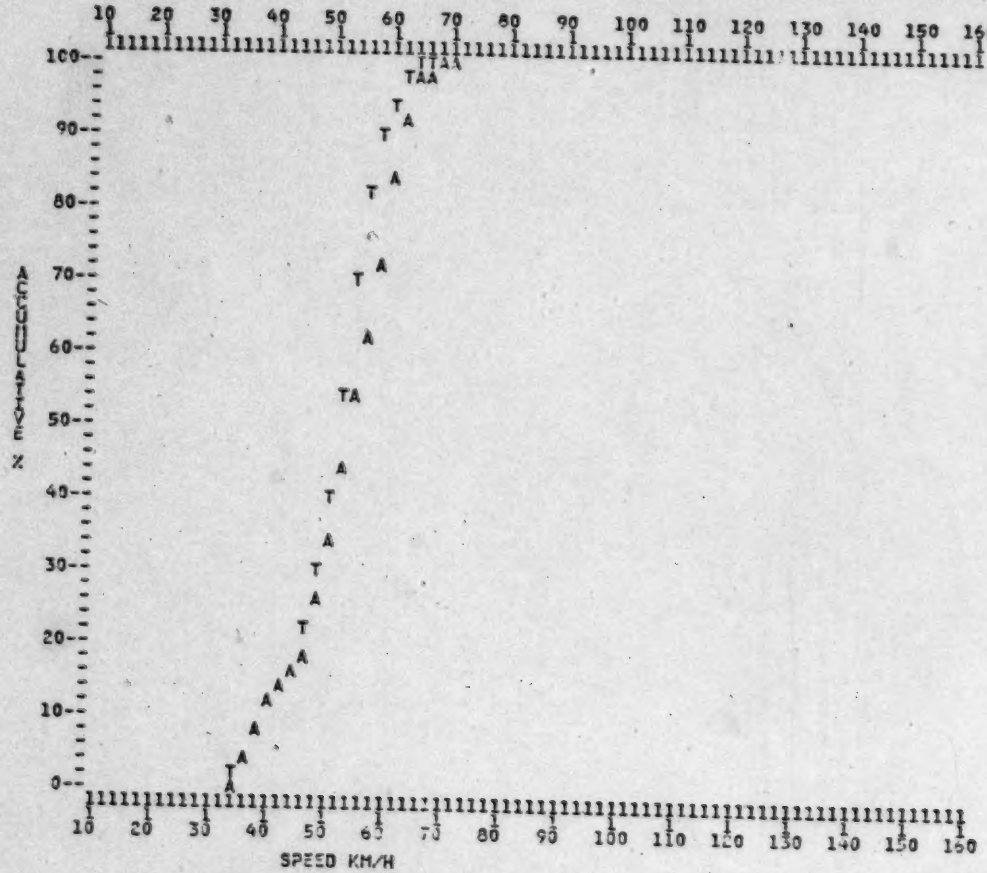
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1701

HIGHWAY 14 LOCATION HWY 14 N RMP N LNE 2CM W 17ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 80 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 36
TRUCKS 80 KM/H TRUCKS 24

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 10 5 STOP TIME 1050 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1711

HIGHWAY 14 LOCATION HWY 14 N RMP S LNE 10M W 17ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 120 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 45 TRUCKS 15

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1050 STOP TIME 1120 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
60	1	0	1	1.3	0.0	1.3	2.22	0.0	2.25	100.00	100.00	100.00
58	2	0	2	2.7	0.0	2.7	4.27	0.0	4.49	97.01	100.00	97.75
56	4	0	4	5.7	0.0	5.7	9.21	0.0	6.18	91.04	100.00	93.22
54	4	0	4	6.0	0.7	6.7	13.43	4.55	11.24	86.84	100.00	87.08
52	10	2	12	7.3	1.3	8.7	15.42	9.09	14.61	69.40	95.45	75.84
50	8	2	10	8.0	2.0	10.0	17.91	13.64	16.85	52.99	85.32	61.24
48	6	1	7	6.0	1.7	7.7	13.43	11.35	12.92	35.07	71.73	44.38
46	4	1	5	4.3	1.7	6.0	9.70	11.35	10.11	21.64	61.36	31.46
44	2	1	3	3.0	2.0	5.0	6.72	13.64	8.43	11.94	50.00	21.35
42	2	1	3	2.7	2.3	5.0	3.73	15.91	5.74	5.22	36.36	12.92
40	2	0	2	1.7	2.7	4.3	1.49	11.35	3.93	1.49	20.46	6.18
38	0	0	0	0.0	0.7	0.7	0.0	4.55	1.12	0.00	9.09	2.25
36	0	0	0	0.0	0.3	0.3	0.0	2.27	0.56	0.00	4.55	1.12
34	0	1	1	0.0	0.3	0.3	0.0	2.27	0.56	0.00	2.27	0.56

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	54.5	49.7	44.6	50.6	1.3	4.5	0.9
TRUCKS	49.8	44.0	39.0	45.2	2.5	4.9	1.8
COMBINED	53.6	48.7	42.5	49.3	1.3	5.2	0.9

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

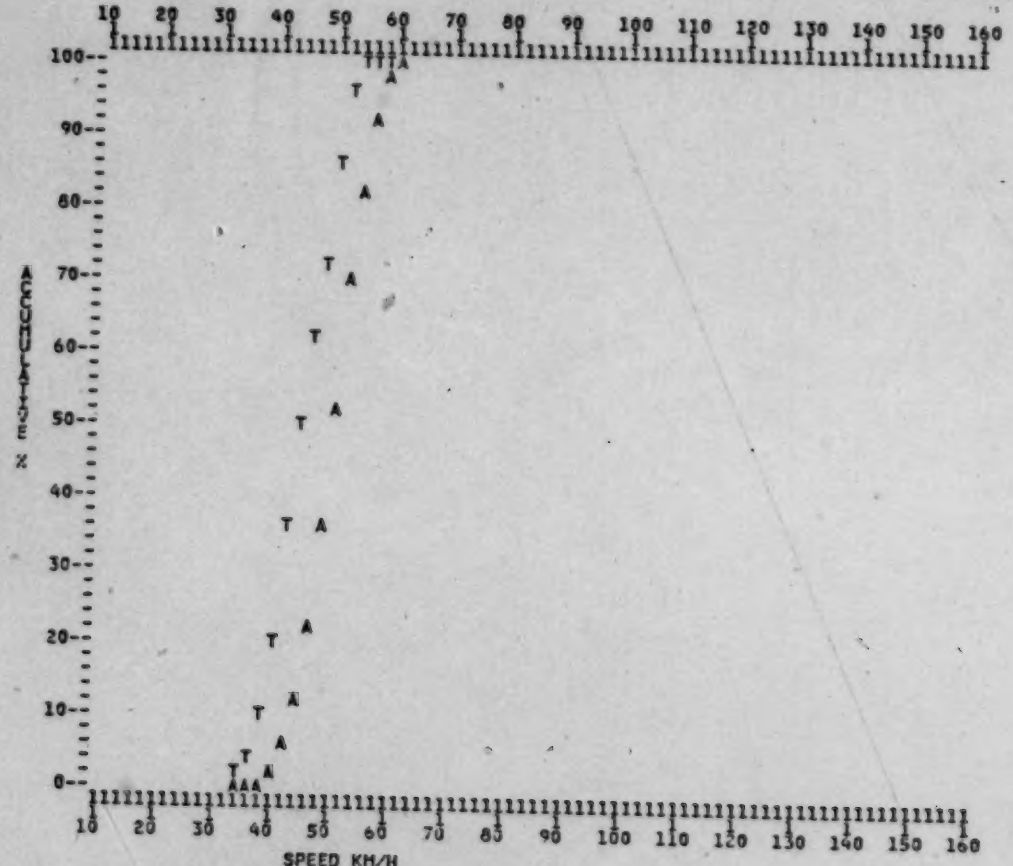
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1711

HIGHWAY 14 LOCATION HWY 14 N RMP S LNE 10M W 17ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 120 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 45 TRUCKS 15

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1050 STOP TIME 1120 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1721

HIGHWAY 14 LOCATION HWY 14 N RAMP 200 M W 17 ST. TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 240 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 44 TRUCKS 16

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1140 STOP TIME 1155 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
84	1	0	1	1.0	0.0	1.0	2.31	0.0	1.69	100.00	100.00	100.00
82	1	0	1	1.7	0.0	1.7	3.85	0.0	2.82	97.69	100.00	98.31
80	2	0	2	2.0	0.0	2.0	4.95	0.0	3.39	93.85	100.00	95.48
78	2	0	2	2.0	0.0	2.0	4.95	0.0	3.38	89.23	100.00	92.09
76	2	0	2	2.3	0.0	2.3	4.99	0.0	3.38	84.31	100.00	87.01
74	2	0	2	2.3	0.0	2.3	4.99	0.0	3.38	79.62	100.00	81.92
72	2	0	2	2.7	0.0	2.7	4.99	0.0	3.38	74.92	100.00	76.83
70	2	0	2	2.7	0.0	2.7	6.15	0.0	4.52	69.92	100.00	75.71
68	3	1	4	3.7	0.3	3.7	7.69	2.13	6.21	60.77	100.00	71.19
66	4	1	5	5.0	0.7	5.0	10.00	4.25	8.47	53.08	97.87	64.97
64	4	1	5	5.3	1.0	5.3	10.00	6.38	9.04	43.08	93.62	56.50
62	3	2	4	4.7	1.3	4.7	7.69	8.51	7.91	33.08	87.23	47.46
60	2	2	4	4.0	1.7	4.0	5.38	10.64	6.78	25.38	78.72	39.55
58	2	2	4	3.7	1.7	3.7	4.62	10.64	6.21	20.00	68.09	32.77
56	2	1	3	3.0	1.3	3.0	3.85	8.51	5.08	15.38	57.45	26.55
54	2	1	3	2.7	1.3	2.7	3.08	8.51	4.52	11.54	48.94	21.47
52	1	1	2	2.0	1.0	2.0	2.31	6.38	3.39	8.46	40.43	16.95
50	1	1	2	1.7	1.0	1.7	1.54	6.38	3.38	6.15	34.04	13.57
48	1	0	1	1.3	0.7	1.3	1.54	4.29	2.82	4.62	27.66	10.17
46	1	0	1	1.0	0.7	1.0	0.77	4.29	2.26	3.08	23.40	8.47
44	0	2	2	1.0	1.0	1.3	0.77	6.38	3.39	2.31	12.77	6.20
42	1	1	2	1.3	1.0	1.3	0.77	6.38	2.26	0.77	6.38	2.26

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	76.8	67.4	57.8	66.1	2.7	9.0	1.9
TRUCKS	63.5	56.2	44.7	56.1	3.9	7.9	2.7
COMBINED	75.3	64.6	52.9	64.9	2.6	10.2	1.8

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

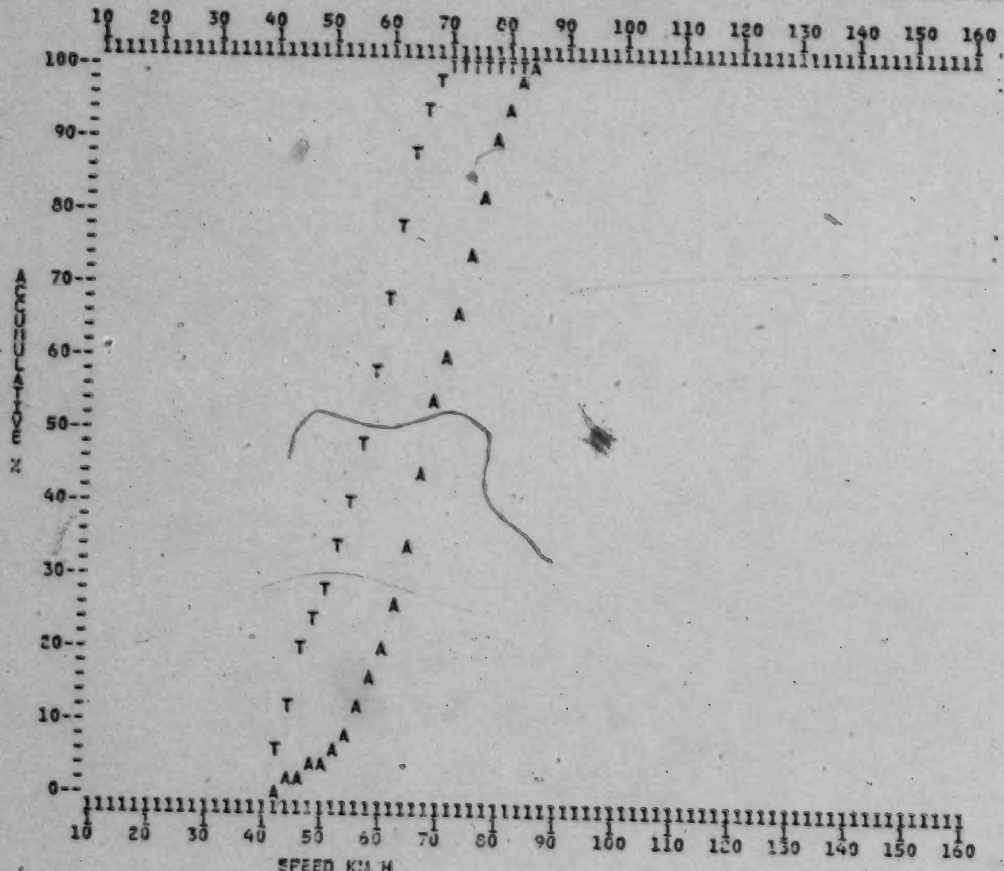
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1721

HIGHWAY 14 LOCATION HWY 14 N RAMP 209 M W 17 ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 240 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 44
TRUCKS 80 KM/H TRUCKS 16

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1140 STOP TIME 1155 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1731

HIGHWAY 14 LOCATION HWY 14 N RAMP 400 M W 17 ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 180 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 44 TRUCKS 16

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1245 STOP TIME 13 5 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
106	1	0	1	0.3	0.0	0.3	0.76	0.0	0.56	100.00	100.00	100.00
104	0	0	0	0.3	0.0	0.3	0.76	0.0	0.56	99.24	100.00	99.44
102	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	98.47	100.00	98.88
100	0	0	0	0.3	0.0	0.3	0.76	0.0	0.56	98.47	100.00	98.88
98	1	0	1	0.7	0.0	0.7	1.53	0.0	1.12	97.71	100.00	98.31
96	1	0	1	1.0	0.0	1.0	2.29	0.0	1.69	96.18	100.00	97.19
94	1	0	1	0.7	0.0	0.7	1.53	0.0	1.12	93.89	100.00	95.51
92	0	0	0	1.3	0.0	1.3	3.05	0.0	2.25	92.37	100.00	94.38
90	3	0	3	1.0	0.0	1.0	2.29	0.0	1.69	89.31	100.00	92.13
88	0	0	0	1.7	0.0	1.7	3.82	0.0	2.81	87.02	100.00	90.45
86	2	0	2	1.3	0.3	1.7	3.05	2.13	2.81	83.21	100.00	87.64
84	2	1	3	2.3	0.3	2.7	5.34	2.13	4.49	80.15	97.87	84.83
82	3	1	4	3.0	0.7	3.7	6.87	4.26	6.18	74.81	95.74	80.34
80	3	0	3	3.0	0.3	3.3	6.87	2.13	5.62	67.94	91.49	74.16
78	4	1	5	4.3	0.7	5.0	9.92	4.26	8.43	61.07	89.36	68.54
76	3	1	4	3.7	0.7	4.3	8.40	4.26	7.30	51.14	85.11	60.11
74	4	1	5	4.3	1.0	5.3	9.92	6.38	8.99	42.75	80.85	52.81
72	2	1	3	2.3	1.7	4.0	5.34	10.64	6.74	32.82	74.47	43.82
70	2	2	4	2.3	2.0	4.3	5.34	12.77	7.30	27.48	63.83	37.08
68	3	2	4	2.7	2.0	4.7	6.11	12.77	7.87	22.14	51.06	29.78
66	3	1	4	2.7	1.3	4.0	6.11	8.51	6.74	16.03	38.30	21.91
64	1	1	2	2.3	0.7	3.0	5.34	4.26	5.06	9.92	29.79	15.17
62	1	0	1	1.0	0.7	1.7	2.29	4.26	2.81	4.58	25.53	10.11
60	1	1	2	0.7	0.7	1.3	1.53	4.26	2.81	2.29	21.28	7.30
58	0	1	1	0.3	1.0	1.3	0.76	6.38	2.25	0.76	17.02	5.06
56	0	1	1	0.0	1.0	1.0	0.0	6.38	1.69	-0.00	10.64	2.81
54				0.0	0.7	0.7	0.0	4.26	1.12	-0.00	4.26	1.12

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	86.9	75.7	65.7	77.4	2.9	9.8	2.1
TRUCKS	75.9	67.8	57.4	68.5	4.0	8.0	2.8
COMBINED	84.1	73.4	63.9	75.0	2.6	10.2	1.8

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

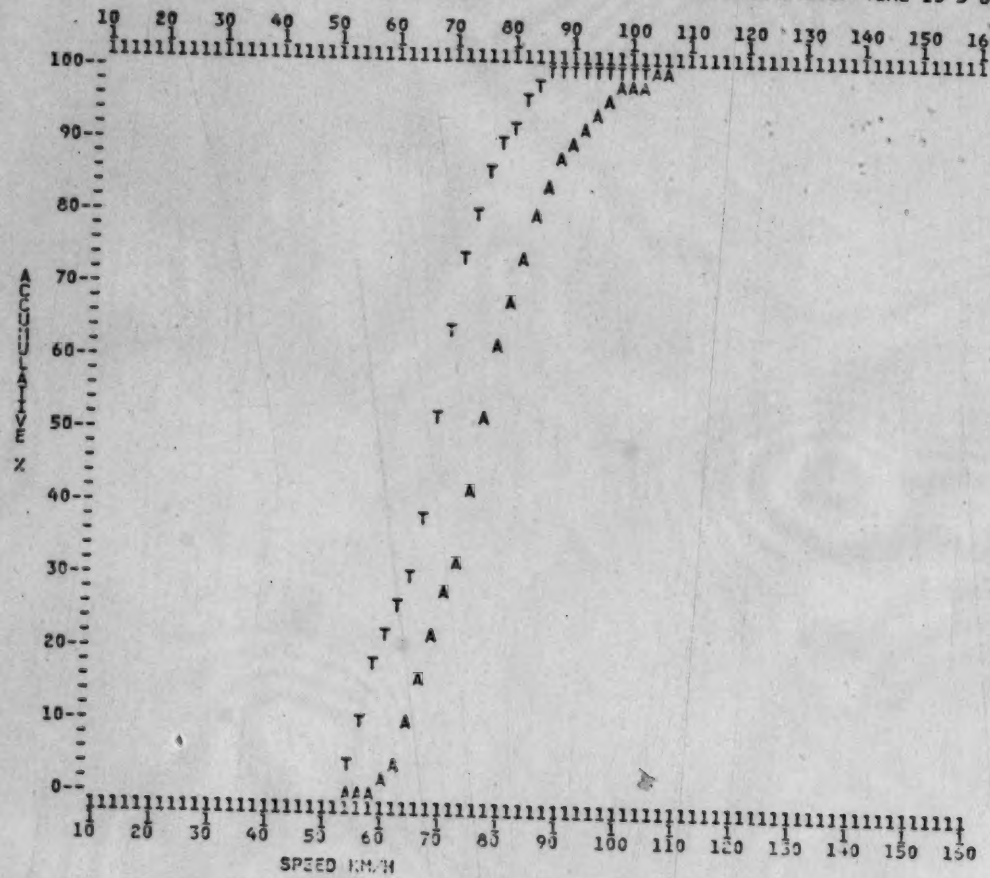
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1731

HIGHWAY 14 LOCATION HWY 14 N RAMP 400 M W 17 ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 180 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 44
TRUCKS 80 KM/H TRUCKS 16

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1245 STOP TIME 13 5 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1701

HIGHWAY 14 LOCATION 20 M W 17 ST N RAMP N LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 34
TRUCKS 80 KM/H TRUCKS 9

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 950 STOP TIME 1015 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
66	1	0	1	0.7	0.0	0.7	2.00	0.0	1.57	100.00	100.00	100.00
64	1	0	1	1.0	0.0	1.0	3.00	0.0	2.36	98.00	100.00	98.43
62	1	0	1	1.3	0.0	1.3	4.00	0.0	3.15	95.00	100.00	96.06
60	2	0	2	1.7	0.3	1.7	4.00	3.70	3.94	91.00	100.00	92.91
58	1	1	2	2.0	0.3	2.3	6.00	3.70	5.51	87.00	96.30	88.98
56	3	0	3	3.0	1.0	3.0	6.00	11.11	7.09	81.00	92.59	83.46
54	2	2	4	3.0	1.3	3.3	9.00	14.81	10.24	75.00	81.48	76.38
52	4	2	6	3.7	1.3	3.0	11.00	14.81	11.81	66.00	66.67	66.14
50	4	1	5	3.7	1.3	3.0	11.00	14.81	11.81	55.00	51.85	54.33
48	3	0	3	3.0	0.7	2.7	9.00	7.41	8.66	44.00	37.04	42.52
46	2	0	2	2.0	0.7	2.7	6.00	7.41	6.30	35.00	29.63	33.86
44	1	0	1	1.3	0.0	1.3	4.00	0.0	3.15	29.00	22.22	27.56
42	1	0	1	1.3	0.0	1.3	4.00	0.0	3.15	25.00	22.22	24.41
40	0	0	0	0.7	0.0	0.7	2.00	0.0	1.57	21.00	22.22	21.26
38	1	0	1	1.3	0.3	1.7	4.00	3.70	3.94	19.00	22.22	19.68
36	1	1	2	1.0	0.7	1.7	3.00	7.41	3.94	15.00	18.52	15.75
34	1	1	2	1.7	0.7	2.3	5.00	7.41	5.51	12.00	11.11	11.81
32	1	0	1	1.0	0.3	1.3	3.00	3.70	3.15	7.00	3.70	6.30
30	0	0	0	0.7	0.0	0.7	2.00	0.0	1.57	4.00	0.00	3.15
28	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.00	0.00	1.57
26	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.00	0.00	1.57
24	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.00	0.00	1.57
22	0	0	0	0.3	0.0	0.3	1.00	0.0	0.79	2.00	0.00	1.57
20	1	0	1	0.3	0.0	0.3	1.00	0.0	0.79	1.00	0.00	0.79

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	57.3	49.1	36.0	48.6	3.3	9.6	2.3
TRUCKS	54.6	49.7	35.0	48.4	5.2	7.9	3.7
COMBINED	56.6	49.3	35.6	48.6	2.8	9.3	2.0

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

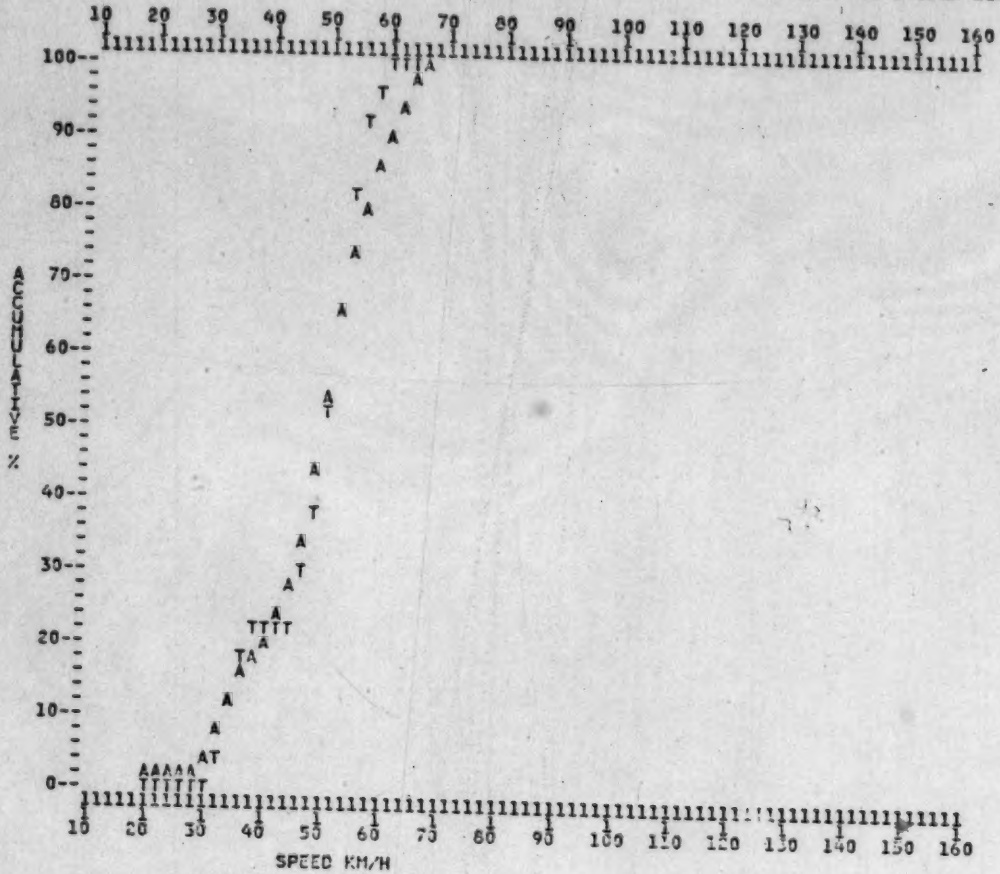
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1701

HIGHWAY 14 LOCATION 20 M W 17 ST N RAMP N LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 34
TRUCKS 80 KM/H TRUCKS 9

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 950 STOP TIME 1015 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPO..ATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1711

HIGHWAY 14 LOCATION 10 M W 17 ST N RAMP S LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 136 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 46 TRUCKS 11

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 950 STOP TIME 1015 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
68	1	0	1	0.3	0.0	0.3	0.74	0.0	0.59	100.00	100.00	100.00
66	0	0	0	0.3	0.0	0.3	0.74	0.0	0.59	99.26	100.00	99.41
64	0	0	0	0.3	0.0	0.3	0.74	0.0	0.59	98.53	100.00	98.82
62	1	0	1	1.0	0.3	1.3	2.21	3.03	2.37	97.79	100.00	98.22
60	1	0	1	1.0	0.3	1.3	2.21	3.03	2.37	95.59	96.97	95.86
58	1	0	1	1.0	0.3	1.3	2.21	3.03	2.37	93.38	93.94	93.49
56	3	0	3	2.7	0.3	2.7	6.62	3.03	5.33	91.18	90.91	91.12
54	4	0	4	3.7	0.3	4.0	8.09	3.03	7.10	84.56	87.88	85.79
52	4	0	4	4.7	0.3	5.0	10.29	3.03	8.88	76.47	84.85	78.69
50	4	0	4	4.7	0.3	5.0	10.29	6.06	9.47	66.18	81.82	69.82
48	6	0	6	6.0	0.7	6.7	13.24	9.09	11.83	55.88	75.76	60.95
46	5	2	7	5.7	1.3	7.0	12.50	12.12	12.43	42.65	66.67	49.11
44	5	2	7	5.0	1.3	6.3	11.03	12.12	11.24	30.15	54.55	36.69
42	2	2	4	3.3	1.3	4.7	7.35	12.12	8.28	19.12	42.42	25.44
40	2	1	3	2.3	1.0	3.3	5.15	9.09	5.63	11.76	30.30	17.16
38	1	0	1	1.0	0.3	1.3	2.21	3.03	2.37	6.62	21.21	11.24
36	0	0	0	0.0	0.3	0.3	0.0	3.03	0.59	4.41	18.18	8.88
34	0	0	0	0.7	0.7	1.3	1.47	6.06	2.37	4.41	15.15	8.28
32	1	0	1	1.0	0.7	1.7	2.21	6.06	2.96	2.21	6.06	2.96

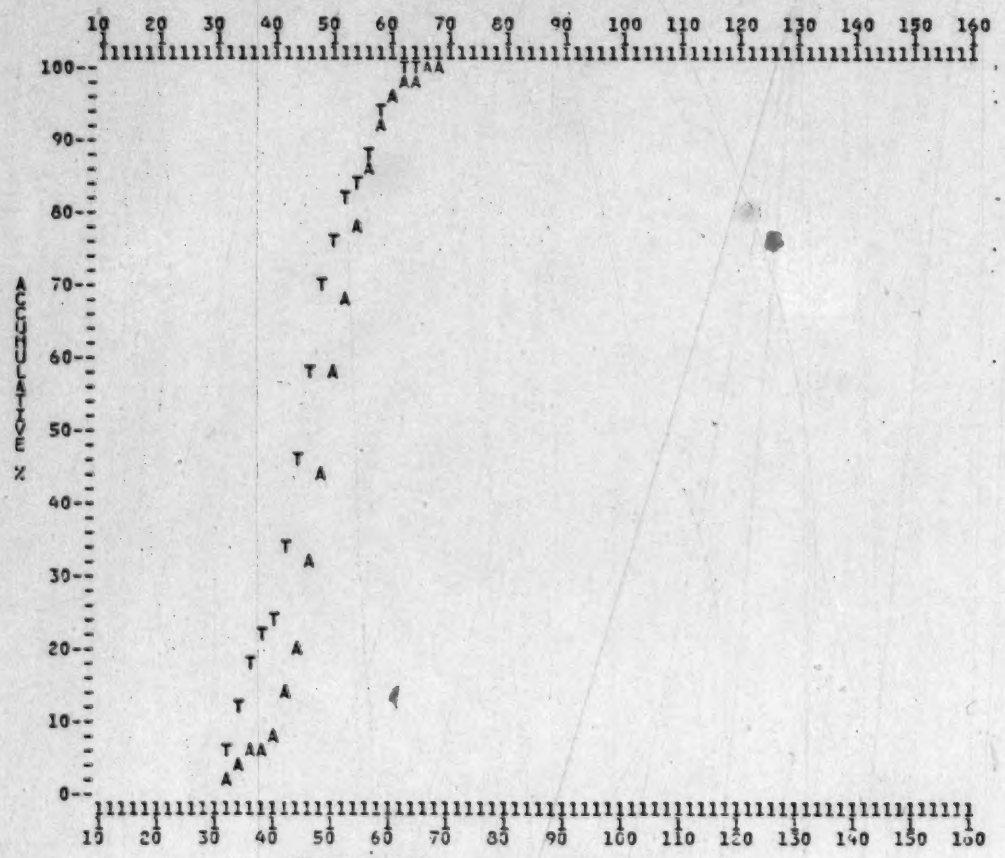
	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	55.7	48.9	42.5	49.8	2.0	6.9	1.4
TRUCKS	54.1	44.7	34.9	45.8	4.7	7.9	3.3
COMBINED	55.6	48.2	41.3	49.0	1.9	7.3	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

HIGHWAY 14 LOCATION 10 M W 17 ST N RAMP S LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 136 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 46
TRUCKS 80 KM/H TRUCKS 11

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 950 STOP TIME 1015 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1721

HIGHWAY 14 LOCATION 250 M W 17 ST O/P N RAMP TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 264 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 89 TRUCKS 21

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 950 STOP TIME 1015 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
86	1	0	1	0.3	0.0	0.3	0.38	0.0	0.30	100.00	100.00	100.00
84	0	0	0	1.0	0.0	1.0	1.13	0.0	0.91	99.62	100.00	99.70
82	2	0	2	1.7	0.0	1.7	1.88	0.0	1.52	98.50	100.00	98.78
80	3	0	3	2.7	0.0	2.7	3.01	0.0	2.44	96.62	100.00	97.26
78	3	0	3	4.0	0.0	4.0	4.51	0.0	3.66	93.61	100.00	94.82
76	4	0	4	4.3	0.0	4.3	4.89	0.0	3.96	89.10	100.00	91.16
74	4	0	4	6.3	0.0	6.3	7.14	0.0	5.79	84.21	100.00	87.20
72	4	0	4	6.0	0.0	6.0	6.77	0.0	5.49	77.07	100.00	81.40
70	5	0	5	6.7	0.0	6.7	7.52	0.0	6.10	70.30	100.00	75.91
68	6	0	6	7.0	0.7	7.7	7.88	5.23	7.01	62.78	100.00	69.81
66	10	2	12	9.7	0.7	10.3	10.90	5.23	9.45	54.89	94.77	62.80
64	13	2	15	9.3	2.0	11.3	10.53	9.68	10.37	43.98	89.54	53.35
62	5	4	9	9.3	2.7	10.7	10.53	19.45	12.76	33.46	79.86	42.98
60	10	4	14	6.3	2.7	9.0	7.14	19.00	10.03	22.93	60.41	30.62
58	4	3	7	4.3	2.7	6.9	5.26	14.06	7.61	15.79	41.41	20.59
56	3	2	5	3.3	2.3	5.7	4.01	11.09	6.09	10.53	27.35	12.98
54	3	2	5	3.0	2.3	5.3	3.76	11.09	5.83	6.77	16.26	6.89
52	2	2	4	2.0	2.3	4.3	2.63	9.68	4.87	3.05	5.17	1.06
50	2	1	3	1.7	2.3	4.0	2.50	6.45	4.57	0.42	0.42	0.19
48	1	1	2	1.7	0.3	2.0	1.50	1.61	1.83	0.00	0.00	0.00
46	1	0	1	0.7	0.3	1.0	0.88	0.00	0.76	0.00	0.00	0.00
44	0	0	0	0.3	0.3	0.7	0.38	0.00	0.30	0.00	0.00	0.00
42	0	1	1	0.0	1.0	1.0	0.0	4.84	0.91	-0.00	4.84	0.91

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	74.3	65.1	57.7	66.5	1.7	8.2	1.2
TRUCKS	62.2	54.9	45.5	55.5	3.0	6.9	2.1
COMBINED	73.2	63.4	54.0	64.4	1.7	9.0	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

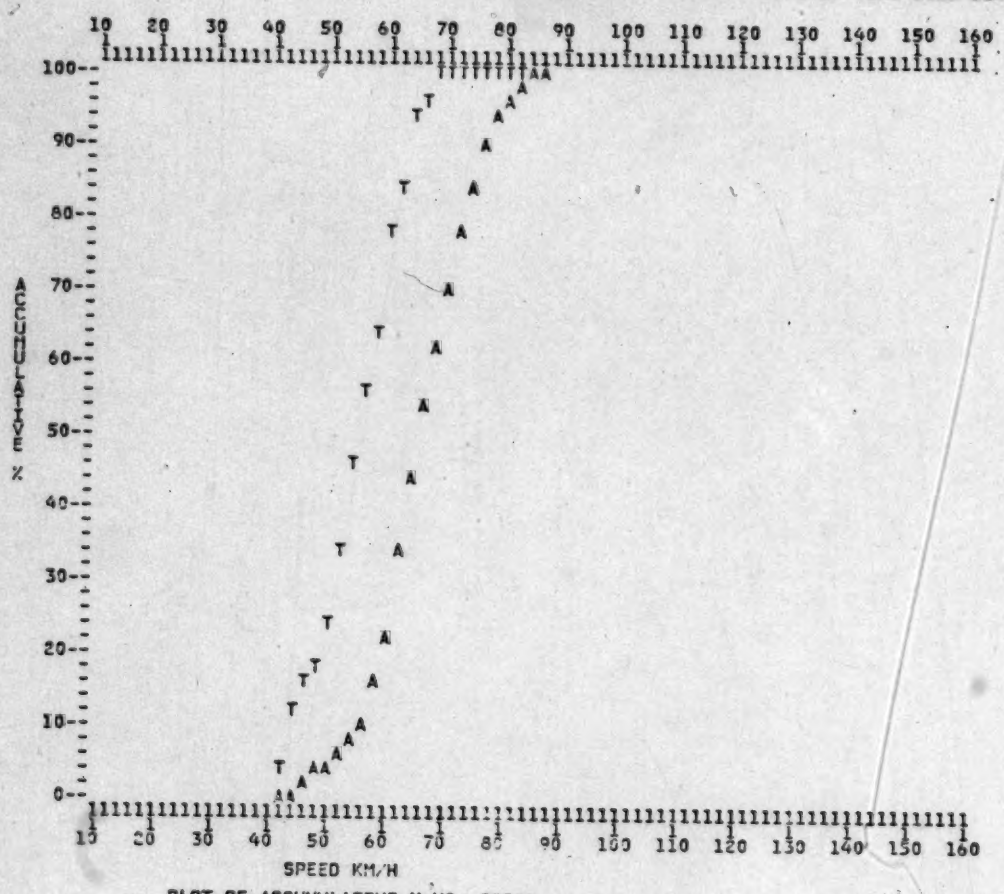
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1721

HIGHWAY 14 LOCATION 250 M W 17 ST O/P N RAMP TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 264 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 89
TRUCKS 80 KM/H TRUCKS 21

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 950 STOP TIME 1015 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1731

HIGHWAY 14 LOCATION 500 M W 17 ST O/P N RAMP TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 223 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 74 TRUCKS 19

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 950 STOP TIME 1015 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
100	2	0	2	0.7	0.0	0.7	0.91	0.0	0.72	100.00	100.00	100.00
98	0	0	0	1.0	0.0	1.0	1.36	0.0	1.09	99.09	100.00	99.29
96	1	0	1	0.3	0.0	0.3	0.45	0.0	0.36	97.73	100.00	99.19
94	0	0	0	0.7	0.0	0.7	0.91	0.0	0.72	97.27	100.00	97.83
92	1	0	1	1.3	0.0	1.3	1.82	0.0	1.45	96.36	100.00	97.10
90	3	0	3	2.3	0.0	2.3	3.18	0.0	2.54	94.55	100.00	95.65
88	3	0	3	2.3	0.0	2.3	3.18	0.0	2.54	91.36	100.00	93.12
86	2	0	2	2.0	0.0	2.0	2.73	0.0	2.17	88.18	100.00	90.58
84	2	0	2	3.0	0.3	3.0	4.09	1.79	3.62	85.45	100.00	88.41
82	5	1	6	4.7	0.3	5.0	6.36	1.79	5.43	81.36	98.21	84.78
80	6	1	7	6.0	0.7	6.7	8.18	3.57	7.25	75.00	96.43	79.35
78	6	1	7	6.7	0.3	7.0	9.09	1.79	7.61	66.82	92.86	72.10
76	8	0	8	7.3	0.3	7.7	10.00	1.79	8.33	57.73	91.07	64.49
74	6	0	6	5.3	0.0	5.3	7.27	0.0	5.80	47.73	89.29	55.16
72	6	0	6	5.3	0.7	6.0	7.27	3.57	6.52	40.45	89.29	50.36
70	8	2	10	5.0	1.0	6.0	6.82	5.36	6.52	33.18	85.71	43.84
68	7	1	8	5.3	1.0	6.3	7.27	5.36	6.88	26.36	80.35	37.32
66	5	1	6	5.7	1.0	6.7	7.00	7.14	7.25	19.09	75.00	30.43
64	3	1	4	4.7	1.0	5.7	5.27	10.71	6.88	14.09	67.86	23.00
62	1	3	4	3.7	1.7	5.3	2.27	14.29	4.71	11.82	57.14	16.01
60	1	2	3	2.7	1.7	4.3	1.36	8.93	2.90	9.55	42.84	11.30
58	1	2	3	1.7	1.3	3.0	1.36	7.14	2.90	8.18	33.93	8.41
56	1	2	3	1.3	1.7	3.0	1.36	7.14	2.90	6.82	26.79	5.51
54	1	1	2	1.3	1.0	2.3	1.36	3.57	1.81	5.45	19.65	3.62
52	0	1	1	0.7	1.0	1.7	0.91	3.57	1.45	4.09	16.08	2.90
50	0	0	0	0.3	0.0	0.3	0.45	0.0	0.36	3.18	12.51	2.17
48	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.73	12.51	1.81
46	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.73	12.51	1.81
44	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.73	12.51	1.81
42	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.73	12.51	1.81
40	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.73	12.51	1.81
38	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.73	12.51	1.81
36	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.73	12.51	1.81
34	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.73	12.51	1.81
32	0	1	1	0.0	0.3	0.3	0.0	1.79	0.36	2.73	12.51	1.81

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	83.8	74.5	64.4	74.8	2.4	10.3	1.7
TRUCKS	69.7	61.9	52.6	62.0	4.4	9.8	3.1
COMBINED	82.1	71.9	59.1	72.2	2.3	11.4	1.6

*RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

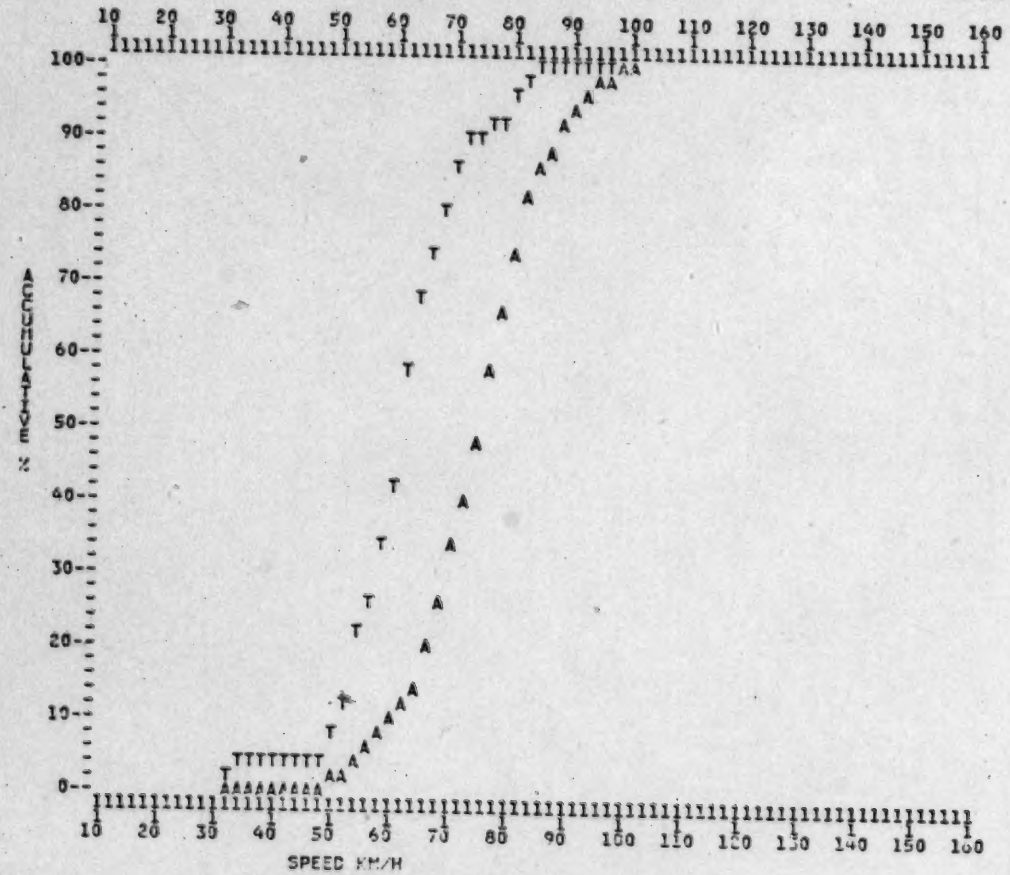
ALBERTA DEPARTMENT OF TRANSPO. ..TION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1731

HIGHWAY 14 LOCATION 500 M W 17 ST O/P N RAMP TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 223 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 74
TRUCKS 80 KM/H TRUCKS 19

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 950 STOP TIME 1015 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 1

HIGHWAY 14 LOCATION NB RAMP 140M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 73 TRUCKS 30

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
90	1	0	1	0.3	0.0	0.3	0.46	0.0	0.33	100.00	100.00	100.00
88	0	0	0	0.3	0.0	0.3	0.46	0.0	0.33	99.54	100.00	99.67
86	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	99.08	100.00	99.35
84	0	0	0	0.3	0.0	0.3	0.46	0.0	0.33	99.08	100.00	99.35
82	1	0	1	0.7	0.0	0.7	0.92	0.0	0.65	98.62	100.00	99.02
80	1	0	1	1.0	0.0	1.0	1.38	0.0	0.98	97.71	100.00	98.37
78	1	0	1	0.7	0.0	0.7	0.92	0.0	0.65	96.33	100.00	97.39
76	0	0	0	2.3	0.0	2.3	3.21	0.0	2.28	95.41	100.00	96.74
74	3	0	3	3.0	0.0	3.0	4.13	0.0	2.91	92.20	100.00	94.46
72	3	0	3	4.3	0.0	4.3	5.96	0.0	4.23	88.07	100.00	91.53
70	3	0	3	3.0	0.0	3.0	4.13	0.0	2.93	82.11	100.00	87.30
68	2	0	2	3.3	0.0	3.3	4.59	0.0	3.26	77.98	100.00	84.36
66	4	0	4	4.0	0.3	4.7	5.96	1.12	4.56	73.39	100.00	81.11
64	7	1	8	6.0	1.0	7.0	8.26	3.37	6.84	67.43	98.88	76.55
62	7	1	8	8.0	1.3	9.3	11.01	4.49	9.12	59.17	95.51	69.71
60	10	1	11	7.7	2.0	9.7	10.55	6.74	9.45	48.17	91.01	60.59
58	6	3	14	8.7	2.7	11.3	11.93	8.99	11.07	37.61	84.27	51.14
56	10	4	14	6.7	4.0	10.7	9.17	13.48	10.42	25.69	75.28	40.07
54	4	5	9	6.0	4.0	10.0	8.26	13.48	9.77	16.51	61.80	29.64
52	4	3	7	3.0	4.0	7.0	4.13	13.48	6.84	8.26	48.31	19.87
50	1	4	5	1.7	3.7	5.3	2.29	12.36	5.21	4.13	34.83	13.03
48	0	4	4	0.3	3.0	3.3	0.46	10.11	3.39	1.83	22.47	7.82
46	0	1	1	0.0	2.0	2.0	0.0	6.74	1.95	1.38	12.36	4.56
44	0	1	1	0.3	0.7	1.0	0.46	3.25	0.98	1.38	5.62	2.61
42	1	0	1	0.3	0.7	1.0	0.46	2.25	0.98	0.92	5.39	1.63
40	0	1	1	0.3	0.3	0.7	0.46	1.12	0.65	0.46	1.12	0.65

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	71.0	60.3	53.6	62.6	1.9	8.2	1.3
TRUCKS	58.2	52.3	46.5	53.3	2.0	5.5	1.4
COMBINED	68.4	57.8	50.6	59.9	1.7	8.6	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

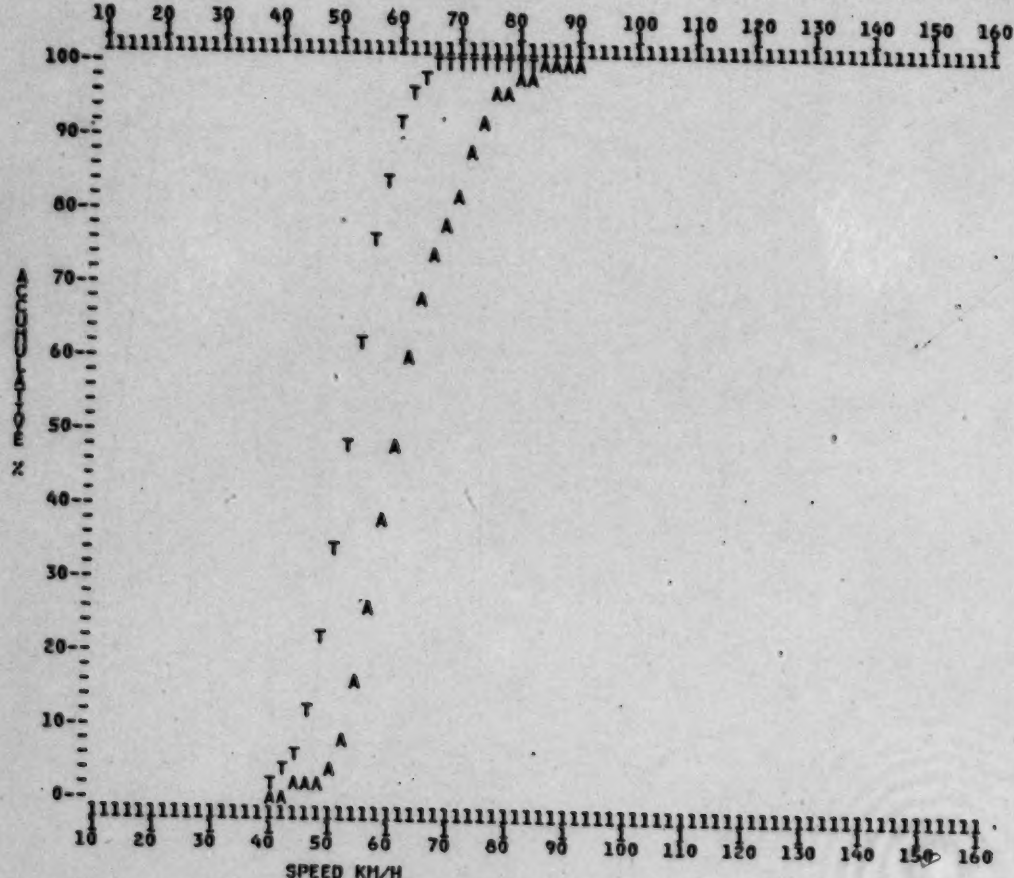
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG 15/80
STUDY NUMBER 1

HIGHWAY 14 LOCATION NW RAMP 140M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 103 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 73 TRUCKS 30

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG 15/80
STUDY NUMBER 2

HIGHWAY 14 LOCATION NW RAMP 190M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 104 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 73 TRUCKS 31

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
94	1	0	1	0.3	0.0	0.3	0.46	0.0	0.32	100.00	100.00	100.00
92	0	0	0	0.3	0.0	0.3	0.46	0.0	0.32	99.54	100.00	99.68
90	0	0	0	0.3	0.0	0.3	0.46	0.0	0.32	99.08	100.00	99.35
88	1	0	1	0.3	0.0	0.3	0.46	0.0	0.32	98.62	100.00	99.03
86	0	0	0	1.3	0.0	1.3	1.83	0.0	1.29	98.17	100.00	98.71
84	1	0	1	1.3	0.0	1.3	1.83	0.0	1.29	97.71	100.00	98.39
82	1	0	1	2.0	0.0	2.0	2.75	0.0	1.94	96.33	100.00	97.42
80	2	0	2	2.7	0.0	2.7	3.21	0.0	2.26	94.50	100.00	96.13
78	2	0	2	2.7	0.0	2.7	3.67	0.0	2.58	91.74	100.00	94.19
76	2	0	2	2.7	0.0	2.7	3.67	0.0	2.58	88.53	100.00	91.94
74	2	0	2	2.7	0.0	2.7	3.67	0.0	2.58	84.86	100.00	89.35
72	4	0	4	4.0	0.0	4.0	5.50	0.0	3.87	81.19	100.00	86.77
70	5	0	5	5.0	0.7	5.7	6.88	2.17	5.48	77.52	100.00	84.19
68	5	0	5	5.0	0.7	5.7	6.88	2.17	5.48	72.02	100.00	80.32
66	5	0	5	5.3	0.7	6.0	6.72	2.17	5.16	65.14	97.83	74.84
64	8	0	8	7.3	1.3	8.7	10.09	4.35	8.39	58.42	95.65	68.06
62	8	1	9	8.3	1.3	9.7	11.47	4.35	9.35	48.33	91.30	59.68
60	8	1	9	8.3	2.7	11.0	11.47	8.70	10.65	36.86	86.96	50.32
58	4	1	5	6.7	4.3	11.0	9.17	14.13	10.65	25.39	78.26	39.68
56	4	1	5	5.3	5.3	10.7	7.34	17.39	10.32	16.22	64.13	29.03
54	3	1	4	3.0	4.3	7.3	4.13	14.13	7.10	8.88	46.74	18.71
52	1	1	2	1.7	3.0	4.7	2.29	9.78	4.52	4.75	32.61	11.61
52	0	1	1	0.3	2.0	2.3	0.46	6.52	2.32	2.75	22.83	7.10
50	0	1	1	0.0	1.3	1.3	0.0	4.91	2.26	-0.00	16.30	4.84
48	0	2	2	0.0	1.3	1.3	0.0	4.35	1.29	-0.00	6.70	2.58
46	0	0	0	0.0	1.0	1.0	0.0	3.26	0.97	-0.00	4.35	1.29
44	0	1	1	0.0	0.3	0.3	0.0	1.09	0.32	-0.00	1.09	0.32

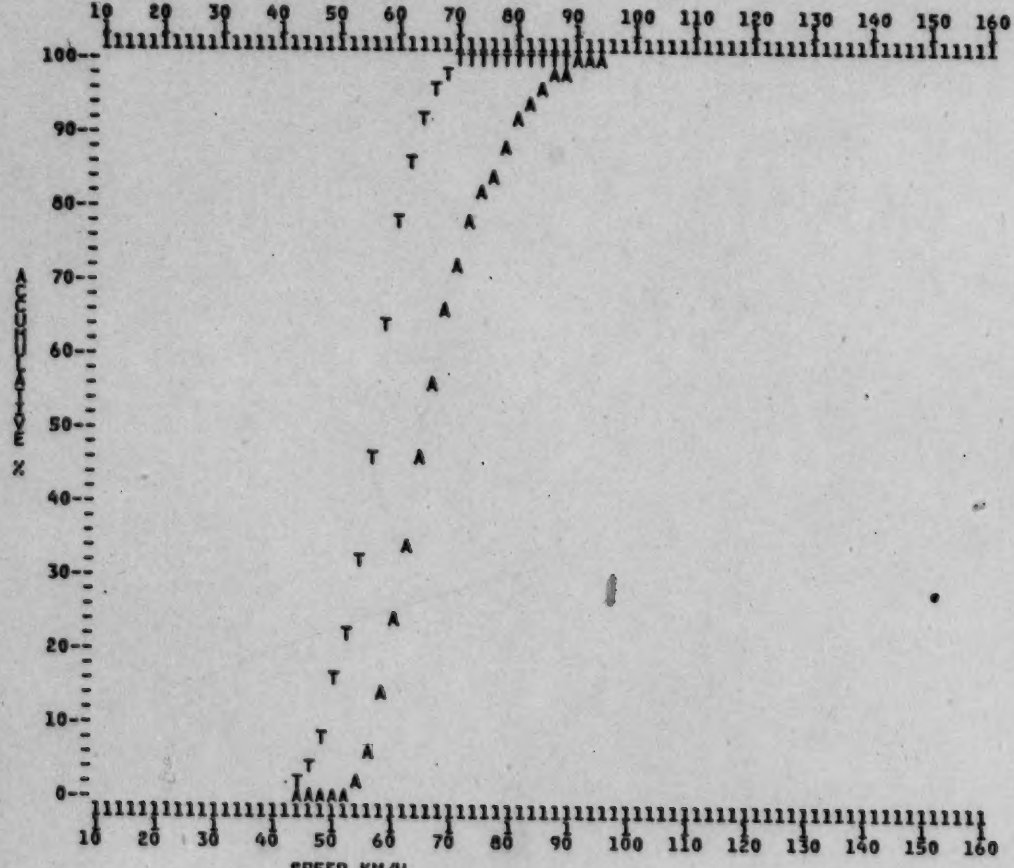
	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	76.1	64.7	58.2	67.3	1.9	8.4	1.4
TRUCKS	61.6	56.4	49.7	57.1	2.0	5.6	1.4
COMBINED	72.6	61.9	55.0	64.3	1.7	9.0	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

HIGHWAY 14 LOCATION NW RAMP 190H W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 104 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 73 TRUCKS 31

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 3

HIGHWAY 14 LOCATION NW RAMP 240M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 100 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 71 TRUCKS 29

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
96	1	0	1	0.3	0.0	0.3	0.47	0.0	0.34	100.00	100.00	100.00
94	0	0	0	0.3	0.0	0.3	0.47	0.0	0.34	99.53	100.00	99.66
92	0	0	0	1.0	0.0	1.0	1.42	0.0	1.01	99.06	100.00	99.33
90	0	0	0	1.0	0.0	1.0	1.42	0.0	1.01	97.64	100.00	98.32
88	1	0	1	1.3	0.0	1.3	1.89	0.0	1.34	96.23	100.00	97.32
86	1	0	1	0.7	0.0	0.7	0.94	0.0	0.67	94.34	100.00	95.97
84	1	0	1	2.3	0.0	2.3	3.30	0.0	2.35	93.40	100.00	95.30
82	2	0	2	2.7	0.0	2.7	3.77	0.0	2.68	90.09	100.00	93.95
80	3	0	3	3.3	0.0	3.3	4.72	0.0	3.36	86.32	100.00	93.27
78	3	0	3	3.0	0.0	3.0	4.25	0.0	3.02	81.60	100.00	90.61
76	4	0	4	4.3	0.3	4.3	5.66	1.16	4.36	77.36	100.00	87.59
74	5	1	6	5.0	0.7	5.0	6.13	2.33	5.03	71.70	98.84	83.89
72	4	1	5	5.0	0.7	5.0	6.13	2.33	5.03	65.57	96.51	78.53
70	4	0	4	5.3	0.3	5.3	7.08	1.16	5.37	59.43	94.19	74.50
68	7	0	7	6.0	1.0	6.0	9.91	3.49	8.05	52.36	93.02	69.46
66	10	3	13	7.0	1.7	7.0	10.38	5.81	9.06	42.45	89.53	64.09
64	5	2	7	7.3	2.3	7.0	10.38	8.14	9.73	32.08	83.72	56.04
62	7	2	9	7.3	3.3	8.7	7.55	11.63	8.72	21.70	75.58	46.98
60	4	6	10	5.3	3.3	6.7	6.60	12.79	8.39	14.15	63.95	37.25
58	3	3	6	4.7	3.7	6.3	4.25	15.12	7.38	7.55	51.16	28.52
56	2	3	5	3.0	4.3	5.3	2.36	11.63	5.03	3.30	36.05	20.13
54	2	3	5	1.7	3.7	4.0	0.94	9.30	3.36	0.94	24.42	12.75
52	0	1	1	0.7	3.7	3.3	0.0	6.98	2.01	-0.00	15.12	7.72
50	0	2	2	0.0	3.0	2.0	0.0	3.49	1.01	-0.00	8.14	4.36
48	0	0	0	0.0	2.0	1.0	0.0	2.33	0.67	-0.00	4.65	2.35
46	0	0	0	0.0	0.7	0.7	0.0	0.0	0.0	-0.00	2.33	1.34
44	0	0	0	0.0	0.0	0.0	0.0	1.16	0.34	-0.00	2.33	0.67
42	0	1	1	0.0	0.3	0.3	0.0	1.16	0.34	-0.00	1.16	0.34

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	79.4	67.5	60.2	70.3	2.1	8.9	1.5
TRUCKS	64.4	57.8	52.0	59.2	2.4	6.4	1.7
COMBINED	76.7	64.7	56.6	67.1	1.9	9.7	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

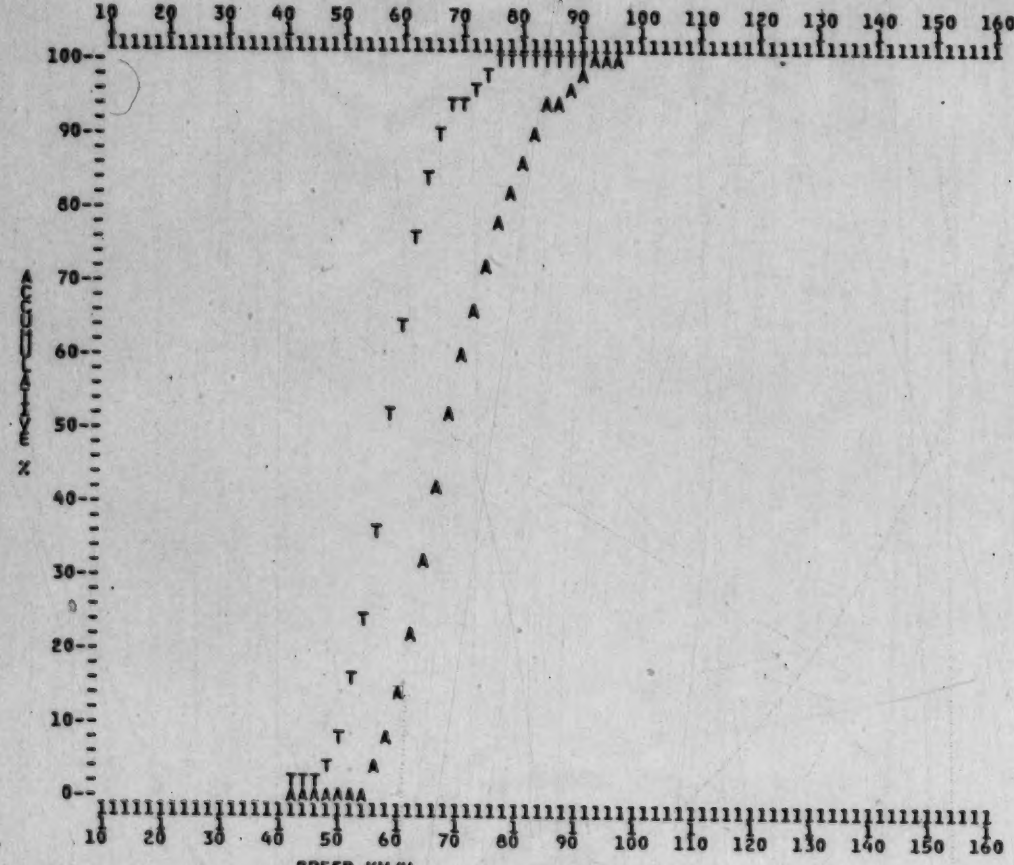
ALBERTA DEPARTMENT OF TRANSPOR[illegible]ON
TRANSPORTATION SAFETY BR[illegible]H
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 3

HIGHWAY 14 LOCATION NW RAMP 240M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 100 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 71 TRUCKS 29

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 4

HIGHWAY 14 LOCATION NW RAMP 290M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 100 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 72 TRUCKS 28

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
108	1	0	1	0.3	0.0	0.3	0.47	0.0	0.34	100.00	100.00	100.00
106	0	0	0	0.3	0.0	0.3	0.47	0.0	0.34	99.53	100.00	99.66
104	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	99.07	100.00	99.33
102	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	99.07	100.00	99.33
100	0	0	0	0.7	0.0	0.7	0.93	0.0	0.67	99.07	100.00	99.33
98	0	0	0	0.7	0.0	0.7	0.93	0.0	0.67	98.14	100.00	98.66
96	0	0	0	1.3	0.0	1.3	1.86	0.0	1.34	97.21	100.00	97.99
94	1	0	1	1.7	0.0	1.7	1.86	0.0	1.68	95.35	100.00	96.64
92	1	0	1	2.0	0.0	2.0	1.86	0.0	1.68	93.02	100.00	94.97
90	1	0	1	2.3	0.0	2.3	2.79	0.0	2.01	90.23	100.00	93.29
88	2	0	2	2.3	0.0	2.3	2.79	0.0	2.35	87.44	100.00	92.95
86	2	0	2	2.0	0.0	2.0	2.79	0.0	2.01	84.65	100.00	90.60
84	2	0	2	2.0	0.0	2.0	2.79	0.0	2.01	81.86	100.00	88.59
82	2	0	2	2.7	0.3	3.0	3.72	0.0	2.68	79.07	100.00	86.58
80	2	0	2	3.3	0.3	3.7	3.72	1.20	3.02	75.35	100.00	83.89
78	3	0	3	4.0	0.3	4.3	4.65	1.20	4.36	71.63	98.80	80.87
76	4	0	4	4.7	0.3	5.0	5.58	1.20	5.37	66.98	97.59	76.51
74	5	0	5	5.3	0.3	5.7	6.51	1.20	6.38	61.40	96.39	71.14
72	6	0	6	6.0	0.3	6.3	7.44	1.20	7.05	54.88	95.18	65.77
70	6	1	7	6.3	0.7	7.0	7.44	2.41	7.72	47.44	93.98	59.73
68	4	1	5	6.0	1.3	7.3	7.44	3.61	8.05	40.00	91.57	53.69
66	4	2	6	5.3	2.3	7.7	7.44	8.43	9.06	32.56	87.95	46.98
64	2	2	4	4.7	3.0	7.7	4.65	9.64	8.05	25.12	79.52	38.93
62	2	2	4	4.3	3.3	7.7	4.65	9.64	8.05	20.47	69.88	30.87
60	2	2	4	4.0	3.7	7.7	4.65	9.64	8.05	15.81	60.24	22.82
58	1	2	3	3.7	4.0	7.7	2.33	9.64	6.38	11.16	50.60	14.77
56	1	2	3	3.3	4.3	7.7	2.33	9.64	6.38	8.84	40.96	8.39
54	0	2	2	3.0	4.7	7.7	0.0	9.64	5.03	6.51	31.33	2.01
52	0	2	2	2.7	5.0	7.7	0.0	9.64	5.03	6.51	21.69	2.01
50	0	2	2	2.3	5.3	7.7	0.0	9.64	5.03	6.51	12.05	2.01
48	0	1	1	2.0	5.3	7.3	0.0	4.82	3.69	6.51	2.41	2.01
46	0	0	0	1.7	5.0	6.7	0.0	0.0	0.0	6.51	-2.41	1.68
44	0	1	1	1.3	4.7	6.0	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.7	4.3	5.0	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	4.0	4.3	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	3.7	4.0	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	3.3	3.7	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	3.0	3.3	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	2.7	3.0	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	2.3	2.7	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	2.0	2.3	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	1.7	2.0	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	1.3	1.7	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	1.0	1.3	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	0.7	1.0	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	0.3	0.7	0.0	2.41	1.01	6.51	-2.41	1.68
	0	1	1	0.3	0.3	0.3	0.0	1.20	0.34	-0.00	-2.41	0.97
	0	1	1	0.0	0.3	0.3	0.0	1.20	0.34	-0.00	1.20	0.34

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	86.6	73.4	64.1	75.5	2.5	10.6	1.7
TRUCKS	68.9	59.6	52.8	61.4	2.8	7.6	2.0
COMBINED	82.8	69.9	57.8	71.6	2.3	11.7	1.6

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

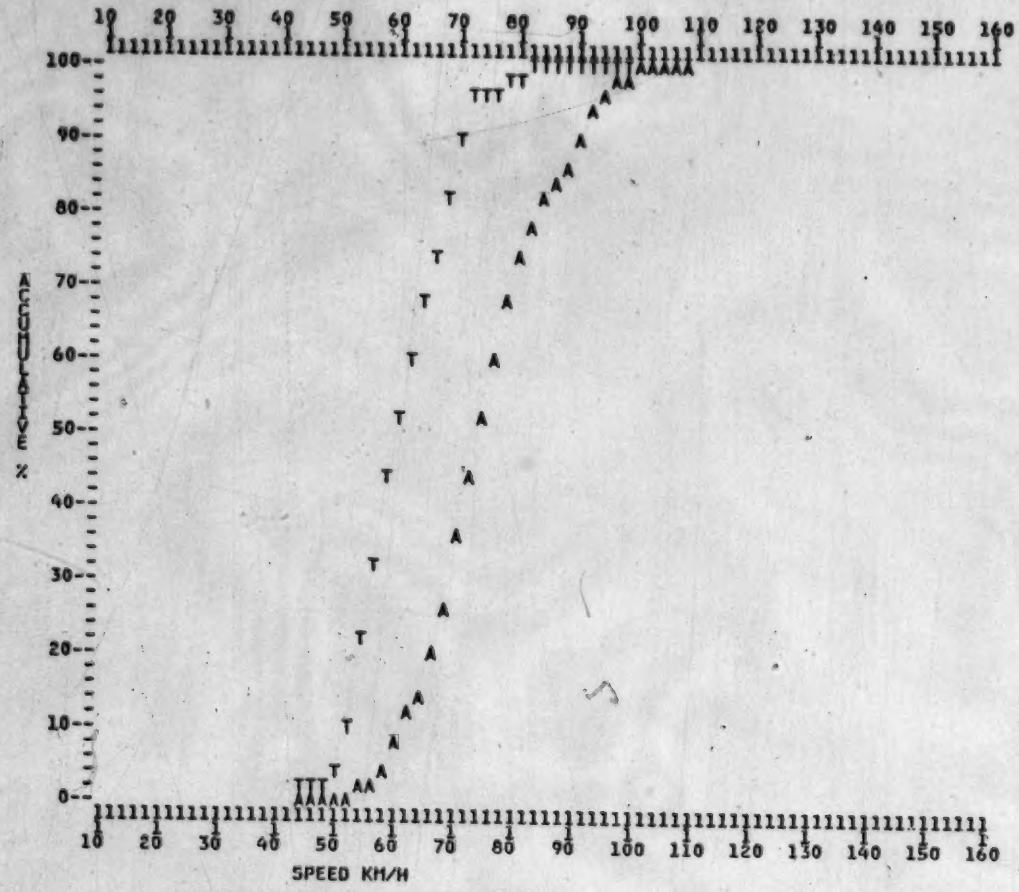
ALBERTA DEPARTMENT OF TRANSPOR (ON
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 4

HIGHWAY 14 LOCATION NW RAMP 290M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 100 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 72 TRUCKS 28

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPOR ON
TRANSPORTATION SAFETY BRA...H
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 5

HIGHWAY 14 LOCATION NW RAMP 340M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 99 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 71 TRUCKS 28

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
110	1	0	1	0.3	0.0	0.3	0.47	0.0	0.34	100.00	100.00	100.00
108	0	0	0	0.3	0.0	0.3	0.47	0.0	0.34	99.53	100.00	99.66
106	0	0	0	0.3	0.0	0.3	0.47	0.0	0.34	99.06	100.00	99.32
104	1	0	1	0.7	0.0	0.7	0.94	0.0	0.68	98.58	100.00	98.98
102	1	0	1	0.7	0.0	0.7	0.94	0.0	0.68	97.64	100.00	98.31
100	0	0	0	0.7	0.0	0.7	0.94	0.0	0.68	96.70	100.00	97.63
98	1	0	1	0.7	0.0	0.7	0.94	0.0	0.68	95.75	100.00	96.95
96	1	0	1	1.7	0.0	1.7	2.36	0.0	1.69	94.81	100.00	96.27
94	3	0	3	2.0	0.0	2.0	2.83	0.0	2.03	92.45	100.00	94.58
92	2	0	2	2.7	0.0	2.7	3.77	0.0	2.71	89.62	100.00	92.54
90	2	0	2	2.3	0.0	2.3	3.30	0.0	2.37	85.85	100.00	89.83
88	2	0	2	2.3	0.0	2.3	3.30	0.0	2.37	82.55	100.00	87.46
86	2	0	2	2.7	0.0	2.7	3.77	0.0	2.71	79.25	100.00	85.08
84	3	0	3	3.0	0.0	3.0	4.25	0.0	3.05	75.47	100.00	82.37
82	3	0	3	3.7	0.0	3.7	5.19	0.0	3.73	71.23	100.00	79.32
80	4	0	4	4.7	0.0	4.7	6.60	0.0	4.75	66.04	100.00	75.59
78	4	0	4	5.3	0.3	5.3	7.08	1.20	5.42	59.43	100.00	70.85
76	4	1	5	5.7	1.7	7.0	8.02	4.82	7.15	52.36	98.80	65.42
74	6	1	7	6.7	2.7	8.3	9.43	6.02	8.47	44.34	93.98	58.30
72	10	1	11	7.0	3.0	9.0	9.91	6.02	9.15	34.91	87.95	49.83
70	5	2	7	5.3	3.0	7.3	7.55	7.23	7.46	25.00	80.72	40.68
68	3	2	4	4.3	3.0	5.0	4.25	7.23	5.08	17.45	73.49	33.22
66	3	1	4	3.7	2.7	4.0	3.30	6.02	4.07	13.21	66.27	28.14
64	3	1	4	3.0	2.0	4.0	4.25	3.61	4.07	9.91	60.24	24.07
62	2	1	4	2.0	1.7	4.7	2.83	2.64	4.75	5.66	56.63	20.00
60	1	1	4	1.3	1.3	4.7	1.89	12.05	4.75	2.83	46.99	15.25
58	1	0	4	0.3	1.7	5.0	0.47	16.87	5.08	0.94	34.94	10.51
56	1	0	5	0.3	2.7	5.0	0.47	9.64	3.05	0.47	18.07	5.42
54	0	0	5	0.0	1.7	1.7	0.0	6.02	1.69	-0.00	8.43	2.37
52	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	-0.00	2.41	0.68
50	0	0	0	0.0	0.3	0.3	0.0	1.20	0.34	-0.00	2.41	0.68
48	0	1	1	0.0	0.3	0.3	0.0	1.20	0.34	-0.00	1.20	0.34

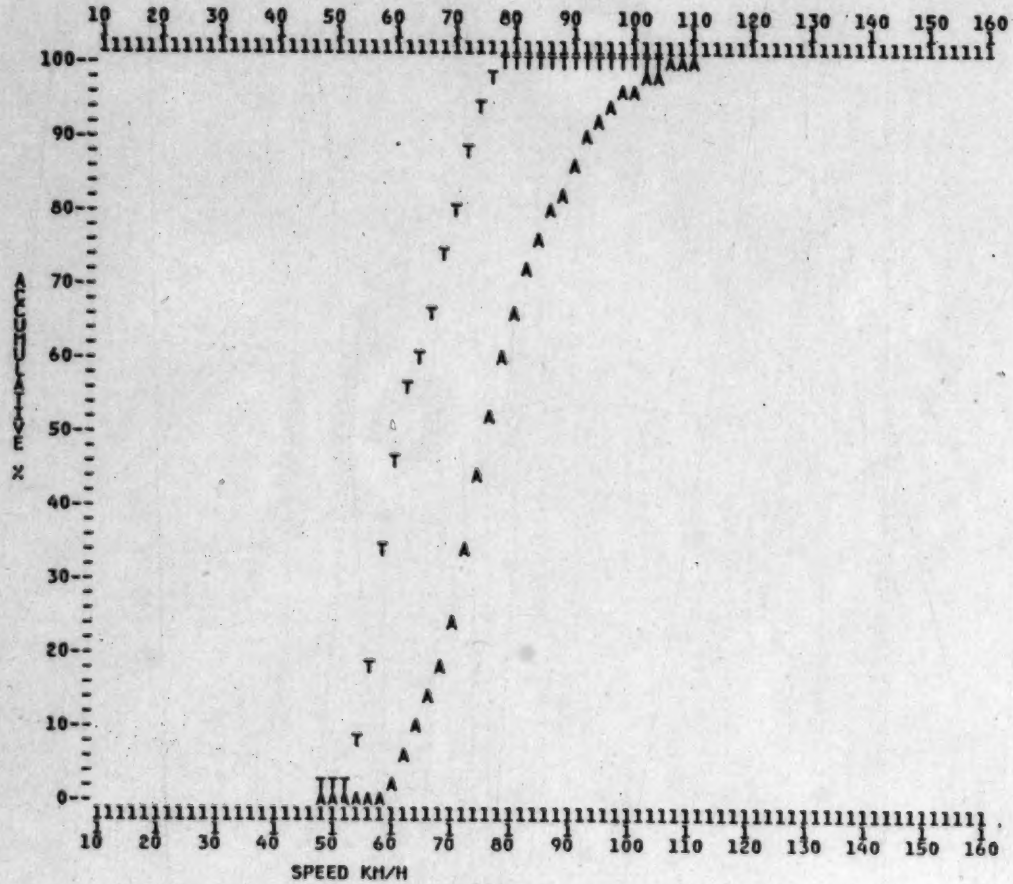
	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	89.5	75.4	66.8	78.2	2.5	10.6	1.8
TRUCKS	71.2	60.6	55.4	63.3	2.6	7.0	1.9
COMBINED	85.9	72.0	59.9	74.0	2.3	11.8	1.7

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

HIGHWAY 14 LOCATION NW RAMP 340M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 99 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H SAMPLE SIZE AUTOS 71
TRUCKS 90 KM/H TRUCKS 28

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED

A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 6

HIGHWAY 14 LOCATION NW RAMP 390M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 99 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H TRUCKS 90 KM/H SAMPLE SIZE AUTOS 71 TRUCKS 28

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
110	2	0	2	0.7	0.0	0.7	0.95	0.0	0.68	100.00	100.00	100.00
108	0	0	0	1.0	0.0	1.0	1.42	0.0	1.02	99.05	100.00	99.32
106	0	0	0	0.3	0.0	0.3	0.47	0.0	0.34	97.63	100.00	98.30
104	0	0	0	0.3	0.0	0.3	0.47	0.0	0.34	97.16	100.00	97.96
102	0	0	0	0.7	0.0	0.7	0.95	0.0	0.68	96.68	100.00	97.62
100	2	0	2	1.0	0.0	1.0	1.42	0.0	1.02	95.73	100.00	96.94
98	1	0	1	1.3	0.0	1.3	1.90	0.0	1.36	94.31	100.00	95.92
96	1	0	1	1.3	0.0	1.3	1.90	0.0	1.36	92.41	100.00	94.56
94	1	0	1	1.3	0.0	1.3	1.90	0.0	1.36	90.51	100.00	93.20
92	2	0	2	1.0	0.0	1.0	1.42	0.0	1.02	88.61	100.00	91.84
90	2	0	2	1.7	0.0	1.7	2.37	0.0	1.70	87.20	100.00	90.82
88	3	0	3	1.7	0.0	1.7	2.84	0.0	2.04	84.83	100.00	89.12
86	3	0	3	2.0	0.0	2.0	3.79	0.0	2.72	82.46	100.00	87.08
84	4	0	4	2.3	0.0	2.3	3.79	0.0	2.72	79.62	100.00	85.37
82	6	1	7	3.3	0.3	3.3	4.27	0.0	3.06	75.36	100.00	82.31
80	5	1	6	4.7	0.7	4.7	4.74	0.0	3.40	70.62	100.00	78.91
78	4	1	5	5.0	0.7	5.7	6.16	1.20	4.76	65.88	98.80	74.15
76	5	1	6	5.7	1.0	5.7	7.11	1.41	5.78	59.72	97.59	69.39
74	6	1	7	5.7	1.0	6.7	7.11	1.41	5.78	52.61	96.39	63.61
72	4	1	5	5.7	1.3	7.0	6.64	1.41	5.78	45.50	94.98	57.83
70	4	1	5	5.3	1.3	6.7	8.06	2.82	6.80	38.86	93.57	52.04
68	4	1	5	5.0	1.3	6.0	7.58	4.65	7.14	30.80	90.76	46.26
66	1	1	2	5.0	2.0	6.0	4.27	7.23	6.80	23.22	86.11	39.12
64	3	2	5	5.3	2.3	6.3	2.51	8.43	6.12	18.95	78.88	32.31
62	0	4	4	5.0	3.0	5.7	4.74	7.23	5.44	16.44	70.65	26.19
60	0	4	4	4.0	3.3	4.7	4.27	8.43	5.44	11.70	63.22	20.75
58	0	3	3	2.0	3.3	3.7	1.42	10.84	4.08	7.43	54.78	15.31
56	0	0	0	0.0	3.7	1.7	0.0	12.05	3.40	6.00	45.58	11.22
54	0	0	0	0.0	3.7	1.7	0.0	10.84	3.06	-0.00	34.94	7.82
52	0	0	0	0.0	1.0	1.0	0.0	6.02	1.70	-0.00	22.89	4.76
50	0	1	1	0.0	0.3	0.3	0.0	3.61	1.02	-0.00	15.05	3.40
							0.0	1.20	0.34	-0.00	9.02	1.70
							0.0	1.20	0.34	-0.00	1.20	0.34

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	90.8	77.9	67.8	80.2	2.5	10.7	1.8
TRUCKS	73.3	63.0	56.5	65.3	2.9	7.7	2.0
COMBINED	87.8	74.0	62.4	76.0	2.4	12.0	1.7

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

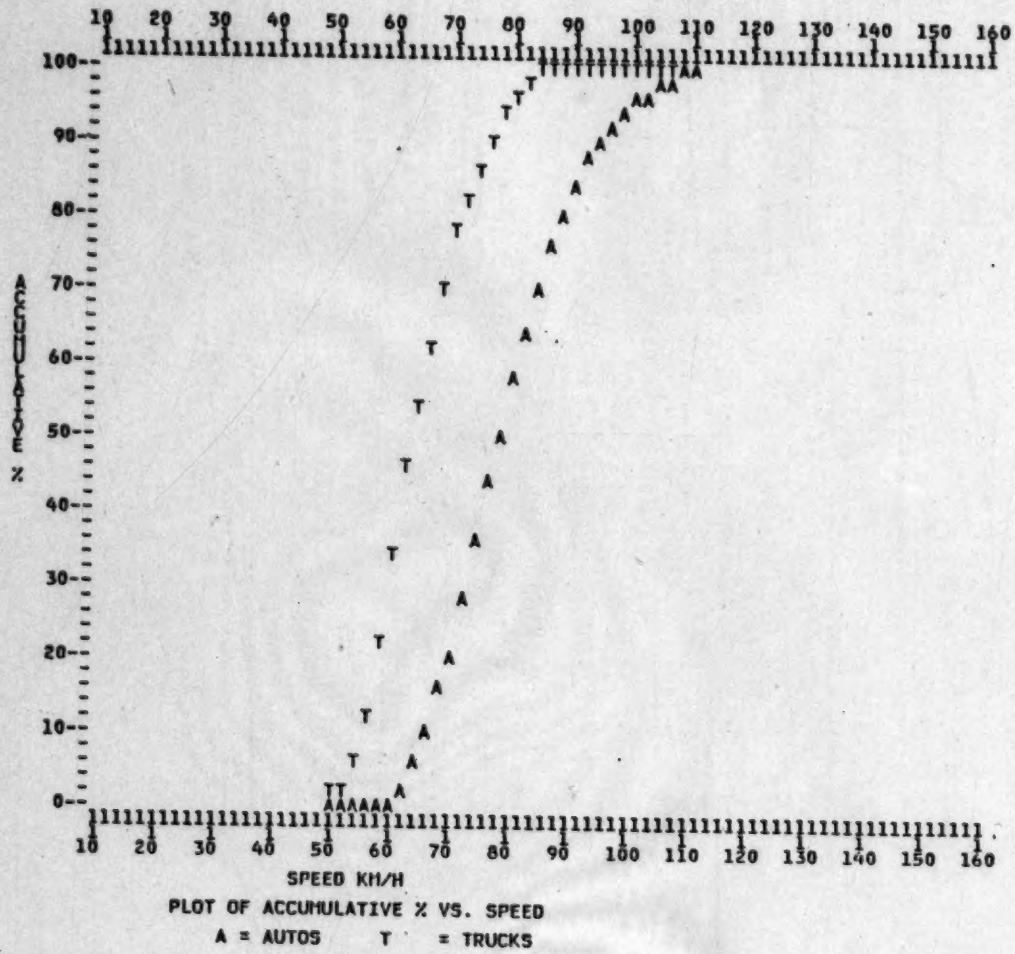
ALBERTA DEPARTMENT OF TRANSPOR ON
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE AUG. 15/80
STUDY NUMBER 6

HIGHWAY 14 LOCATION NW RAMP 390M W 17ST AT HWY 14 TYPE OF HIGHWAY TWO LANE HIGH ST

TRAFFIC DENSITY 99 VEHICLES PER HOUR SPEED LIMIT AUTOS 100 KM/H SAMPLE SIZE AUTOS 71
TRUCKS 90 KM/H TRUCKS 28

DATE 11 7 80 LIGHT CONDITIONS-- DAY START TIME 15 0 STOP TIME 16 0 DIRECTION OF TRAVEL W AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

APPENDIX 4

EXIT TERMINAL 1

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 241

HIGHWAY 2 LOCATION S.B.NORTH LEDUC OVERPASS TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 120 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 54 TRUCKS 6

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1020 STOP TIME 1050 DIRECTION OF TRAVEL S AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
100	1	0	1	0.3	0.0	0.3	0.62	0.0	0.56	100.00	100.00	100.00
98	0	0	0	0.3	0.0	0.3	0.62	0.0	0.56	99.37	100.00	99.44
96	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	98.75	100.00	98.88
94	0	0	0	0.7	0.0	0.7	1.25	0.0	1.12	98.75	100.00	98.88
92	1	0	1	1.0	0.0	1.0	1.87	0.0	1.69	97.50	100.00	97.75
90	1	0	1	1.0	0.0	1.0	1.87	0.0	1.69	95.62	100.00	95.07
88	1	0	1	1.0	0.0	1.0	1.87	0.0	1.69	93.75	100.00	94.38
86	0	0	0	0.7	0.0	0.7	1.25	0.0	1.12	91.87	100.00	92.70
84	2	0	2	2.3	0.0	2.3	4.37	0.0	3.93	90.62	100.00	91.57
82	3	0	3	2.7	0.3	3.0	5.00	5.56	5.06	86.25	100.00	87.64
80	3	1	4	3.3	0.7	4.0	6.25	5.56	6.18	81.25	94.44	82.58
78	2	0	2	2.3	1.0	3.3	4.37	16.67	5.62	75.00	88.89	76.40
76	2	1	3	2.0	1.7	3.0	4.37	11.11	5.06	70.62	72.22	70.79
74	2	0	2	2.0	1.3	3.3	3.75	16.67	5.06	66.25	61.11	65.73
72	1	1	2	3.0	2.3	5.3	5.62	5.56	5.62	62.50	44.45	60.67
70	3	0	3	3.7	3.7	7.3	6.87	11.11	7.30	56.87	33.89	55.06
68	3	0	3	4.3	0.3	4.7	8.12	5.56	7.87	50.00	27.78	47.75
66	3	0	3	4.3	0.3	4.7	8.12	5.56	7.87	41.87	22.22	39.89
64	2	0	2	3.3	0.3	3.7	6.25	5.56	6.18	33.75	16.67	32.02
62	2	0	2	3.0	0.3	3.3	5.62	5.56	5.62	27.50	11.11	25.84
60	2	0	2	2.9	0.3	3.3	5.62	5.56	5.62	21.87	5.56	20.22
58	1	0	1	2.3	0.0	2.3	4.37	0.0	3.93	16.25	0.00	14.61
56	1	0	1	2.0	0.0	2.0	3.75	0.0	3.37	11.87	0.00	10.67
54	1	0	1	1.0	0.0	1.0	1.87	0.0	1.69	8.12	0.00	7.30
52	1	0	1	1.3	0.0	1.3	2.50	0.0	2.25	6.25	0.00	5.62
50	1	0	1	1.0	0.0	1.0	1.87	0.0	1.69	3.75	0.00	3.37
48	0	0	0	0.3	0.0	0.3	0.62	0.0	0.56	1.87	0.00	1.69
46	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.25	0.00	1.12
44	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.25	0.00	1.12
42	0	0	0	0.3	0.0	0.3	0.62	0.0	0.56	1.25	0.00	1.12
40	1	0	1	0.3	0.0	0.3	0.62	0.0	0.56	0.62	0.00	0.56

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	81.5	63.0	57.4	70.1	3.1	11.5	2.2
TRUCKS	77.5	72.7	63.4	72.3	4.9	6.2	3.5
COMBINED	81.0	68.6	58.1	70.4	2.8	11.1	2.0

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

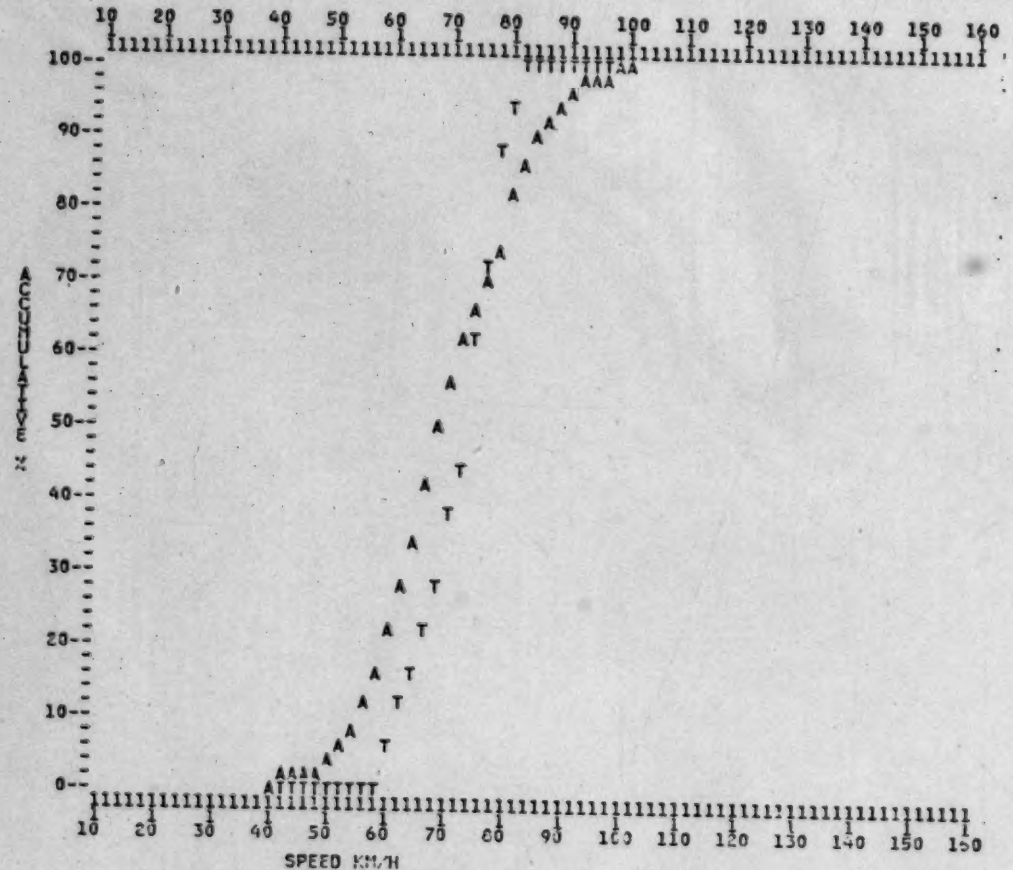
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 241

HIGHWAY 2 LOCATION S.B.NORTH LEDUC OVERPASS TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 120 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 54
TRUCKS 80 KM/H TRUCKS 6

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1020 STOP TIME 1050 DIRECTION OF TRAVEL S AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 251

HIGHWAY 2 LOCATION S.B. NORTH LEDUC OVERPASS TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 132 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 51 TRUCKS 15

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 11 0 STOP TIME 1130 DIRECTION OF TRAVEL S AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
104	1	0	1	0.3	0.0	0.3	0.66	0.0	0.51	100.00	100.00	100.00
102	0	0	0	0.7	0.0	0.7	1.32	0.0	1.02	99.34	100.00	99.49
100	1	0	1	0.3	0.0	0.3	0.66	0.0	0.51	98.01	100.00	98.47
98	2	0	2	1.3	0.0	1.3	2.65	0.0	2.04	97.35	100.00	97.96
96	2	0	2	1.3	0.0	1.3	2.65	0.0	2.04	94.70	100.00	95.92
94	1	0	1	0.7	0.0	0.7	1.32	0.0	1.02	92.05	100.00	93.88
92	4	0	4	2.7	0.3	3.0	5.30	0.0	4.08	90.73	100.00	92.86
90	3	1	4	3.0	0.3	3.3	3.97	2.22	3.57	85.43	100.00	89.80
88	4	1	5	3.7	0.7	4.3	5.30	4.44	5.10	81.46	97.78	86.22
86	3	1	4	3.0	1.0	4.0	3.97	6.67	4.59	77.48	93.33	81.12
84	4	1	5	3.3	1.0	4.3	4.64	6.67	5.10	73.51	86.67	76.53
82	4	1	5	3.7	1.0	4.7	5.30	6.67	5.61	68.87	80.00	71.43
80	2	1	3	3.7	0.7	4.3	5.30	4.44	5.10	63.58	73.33	65.82
78	4	1	5	3.3	1.3	4.7	6.62	8.89	7.14	58.28	68.89	60.71
76	5	1	6	3.7	1.3	5.0	7.28	8.89	7.65	51.66	60.00	53.57
74	3	1	4	5.0	1.3	6.3	9.93	8.89	9.69	44.37	51.11	45.92
72	3	2	5	4.7	1.0	5.7	9.27	6.67	8.67	34.44	42.22	36.22
70	2	1	3	3.7	1.0	4.7	7.28	6.67	7.14	25.17	35.55	27.55
68	2	1	3	2.3	1.7	4.0	4.64	11.11	6.12	17.88	28.88	20.41
66	2	2	4	2.0	1.0	3.0	3.97	6.67	4.59	13.24	17.78	14.29
64	2	0	2	1.3	0.7	2.0	2.65	4.44	3.06	9.27	11.11	9.69
62	1	0	1	1.0	0.0	1.0	1.99	0.0	1.53	6.62	6.67	6.63
60	1	0	1	0.7	0.3	1.0	1.32	2.22	1.53	4.64	6.67	5.10
58	1	0	1	0.7	0.3	1.0	1.32	2.22	1.53	3.31	4.45	3.57
56	0	0	0	0.3	0.3	0.7	0.66	2.22	1.02	1.99	2.22	2.04
54	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.32	0.00	1.02
52	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.32	0.00	1.02
50	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.32	0.00	1.02
48	1	0	1	0.3	0.0	0.3	0.66	0.0	0.51	1.32	0.00	1.02
							0.66	0.0	0.51	0.66	0.00	0.51

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	91.1	77.5	68.8	79.8	2.9	10.5	2.1
TRUCKS	85.5	75.7	67.2	76.7	4.2	8.3	3.0
COMBINED	89.5	77.1	68.2	79.1	2.5	10.2	1.7

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

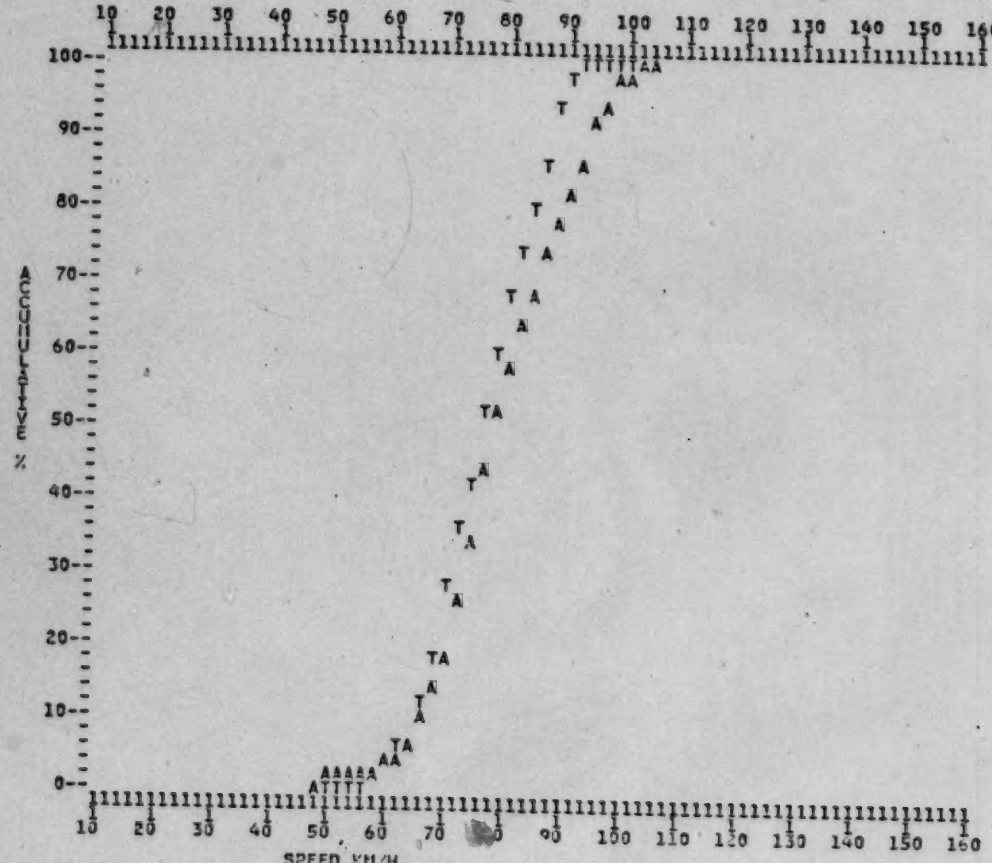
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 251

HIGHWAY 2 LOCATION S.B. NORTH LEDUC OVERPASS TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 132 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 51
TRUCKS 80 KM/H TRUCKS 15

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 11 0 STOP TIME 1130 DIRECTION OF TRAVEL S AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 261

HIGHWAY 2 LOCATION S.B. NORTH LEDUC OVERPASS TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 93 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 58
TRUCKS 80 KM/H TRUCKS 4

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1140 STOP TIME 1220 DIRECTION OF TRAVEL S AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
96	1	0	1	0.3	0.0	0.3	0.58	0.0	0.54	100.00	100.00	100.00
94	0	0	0	0.3	0.0	0.3	0.58	0.0	0.54	99.42	100.00	99.45
92	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	98.84	100.00	98.91
90	0	0	0	0.7	0.0	0.7	1.16	0.0	1.09	98.84	100.00	98.91
88	0	0	0	1.0	0.0	1.0	1.74	0.0	1.63	97.67	100.00	97.83
86	1	0	1	1.7	0.0	1.7	2.91	0.0	2.72	95.93	100.00	96.20
84	1	0	1	1.3	0.0	1.3	2.33	0.0	2.17	93.02	100.00	93.48
82	1	0	1	2.3	0.0	2.3	4.07	0.0	3.80	90.70	100.00	91.30
80	2	0	2	2.7	0.0	2.7	4.65	0.0	4.35	86.63	100.00	87.50
78	3	0	3	4.3	0.0	4.3	7.56	0.0	7.07	81.98	100.00	83.15
76	4	0	4	4.3	0.0	4.3	7.56	0.0	7.07	74.42	100.00	76.09
74	2	1	3	4.0	0.7	4.7	6.98	8.33	7.61	66.85	91.67	68.48
72	2	1	3	4.0	0.7	4.7	6.93	16.67	7.61	59.88	75.00	60.87
70	3	0	3	4.3	0.7	4.7	5.81	8.33	5.98	52.91	58.33	53.26
68	3	0	3	3.3	0.0	3.3	5.81	0.0	5.43	47.08	50.00	47.83
66	3	0	3	3.7	0.0	3.7	6.40	0.0	5.98	41.26	50.00	41.85
64	2	0	2	3.0	0.0	3.0	5.23	0.0	4.89	34.83	50.00	35.87
62	3	0	3	3.3	0.7	3.7	5.81	8.33	5.98	29.65	50.00	30.98
60	2	1	3	3.0	0.7	3.7	3.48	16.67	4.35	23.84	41.67	25.00
58	2	1	3	3.3	0.7	4.0	4.07	16.67	4.89	20.35	25.00	20.65
56	2	0	2	2.3	0.3	2.7	4.07	8.33	4.35	16.28	8.33	15.76
54	2	0	2	2.3	0.0	2.3	4.07	0.0	3.80	12.21	0.00	11.41
52	2	0	2	1.3	0.0	1.3	2.33	0.0	2.17	8.14	0.00	7.61
50	0	0	0	0.3	0.0	0.3	0.58	0.0	0.54	4.07	0.00	3.80
48	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.74	0.00	1.63
46	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.16	0.00	1.09
44	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.16	0.00	1.09
42	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.16	0.00	1.09
40	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.16	0.00	1.09
38	0	0	0	0.3	0.0	0.3	0.58	0.0	0.54	1.16	0.00	1.09
36	1	0	1	0.3	0.0	0.3	0.58	0.0	0.54	0.58	0.00	0.54

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	79.3	69.0	55.4	69.1	2.8	11.0	2.0
TRUCKS	73.2	62.0	56.8	66.0	7.1	7.3	5.0
COMBINED	78.9	68.9	55.7	68.9	2.7	10.8	1.9

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

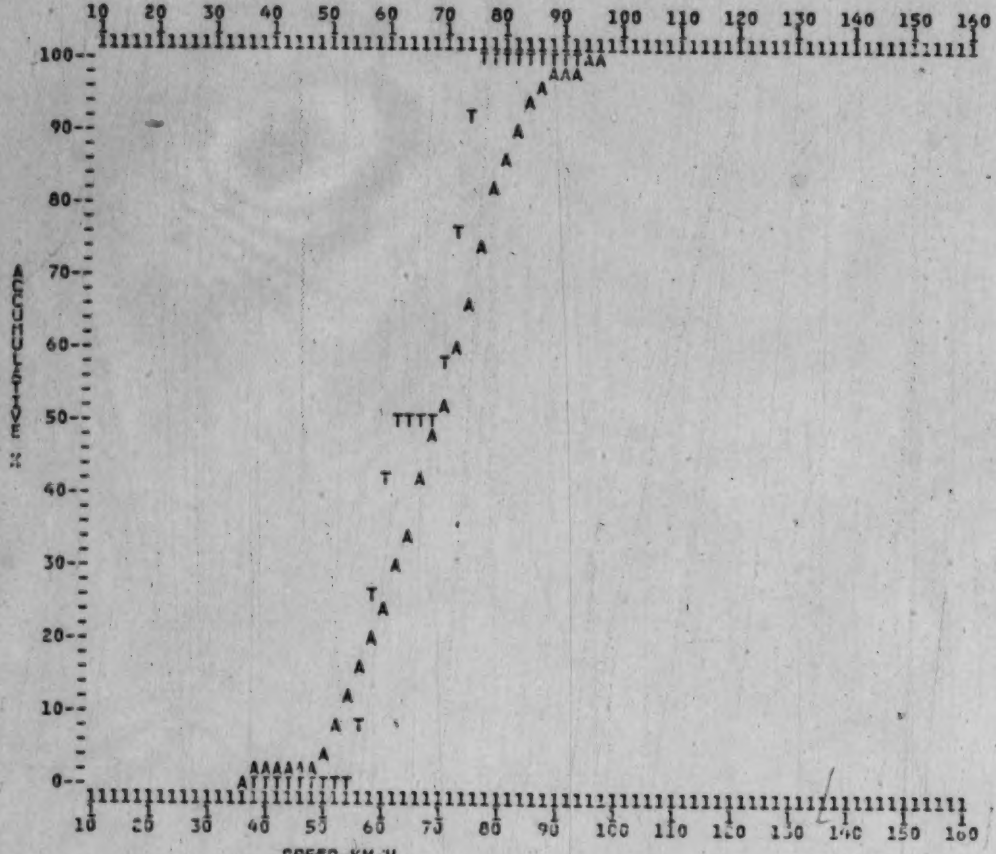
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 261

HIGHWAY 2 LOCATION S.B. NORTH LEDUC OVERPASS TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 93 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 58
TRUCKS 80 KM/H TRUCKS 4

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1140 STOP TIME 1220 DIRECTION OF TRAVEL S AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 241

HIGHWAY 2 LOCATION 550 M S ENTRANCE LEDUC O/P TYPE OF HIGHWAY SIX LANE DIVIDED

TRAFFIC DENSITY 150 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 90 TRUCKS 10

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1110 STOP TIME 1150 DIRECTION OF TRAVEL S AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
110	1	0	1	0.3	0.0	0.3	0.37	0.0	0.34	100.00	100.00	100.00
108	0	0	0	0.3	0.0	0.3	0.37	0.0	0.34	99.63	100.00	99.66
106	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	99.25	100.00	99.33
104	1	0	1	0.3	0.0	0.3	0.37	0.0	0.34	99.25	100.00	99.33
102	1	0	1	0.7	0.0	0.7	0.75	0.0	0.67	98.88	100.00	98.99
100	2	0	2	2.0	0.0	2.0	2.24	0.0	2.01	98.13	100.00	98.32
98	4	0	4	2.7	0.0	2.7	2.99	0.0	2.68	95.90	100.00	96.31
96	3	0	3	3.0	0.3	3.3	3.35	3.33	3.35	93.91	100.00	93.63
94	3	0	3	3.0	0.3	3.3	3.35	3.33	3.35	90.55	96.67	90.28
92	4	0	4	3.3	0.3	3.7	3.73	3.33	3.69	86.19	93.33	86.91
90	4	0	4	3.7	0.7	4.3	4.10	6.67	4.36	82.46	90.00	83.22
88	3	1	4	4.3	1.0	5.3	4.85	10.00	5.37	78.39	83.33	79.85
86	6	1	7	6.3	1.0	7.3	7.09	10.00	7.38	73.51	73.33	73.49
84	10	0	10	7.7	0.3	8.0	8.58	3.33	8.05	66.42	63.33	66.11
82	7	0	7	7.3	0.0	7.3	8.21	0.0	7.38	57.84	60.00	58.02
80	5	0	5	7.3	0.7	8.0	8.21	6.67	8.05	49.63	60.00	50.67
78	10	2	12	6.7	0.7	7.3	7.46	6.67	7.38	41.42	53.33	42.62
76	5	0	5	6.7	1.3	8.0	7.46	13.33	8.05	33.96	46.67	35.23
74	5	2	7	4.3	0.7	5.0	4.85	6.67	5.03	26.49	33.33	27.18
72	3	0	3	4.7	1.0	5.7	5.22	10.00	5.70	21.64	26.67	22.15
70	3	1	4	4.0	0.7	4.7	4.48	6.67	4.70	16.42	16.67	16.44
68	3	1	4	3.7	0.7	4.3	4.10	6.67	4.36	11.94	10.00	11.74
66	2	0	2	3.0	0.3	3.3	3.35	3.33	3.35	7.84	3.33	7.38
64	4	0	4	2.0	0.0	2.0	2.24	0.0	2.01	4.48	0.00	4.03
62	0	0	0	1.3	0.0	1.3	1.49	0.0	1.34	2.24	0.00	2.01
60	0	0	0	0.3	0.0	0.3	0.37	0.0	0.34	0.75	0.00	0.67
53	1	0	1	0.3	0.0	0.3	0.37	0.0	0.34	0.37	0.00	0.34

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	91.4	80.1	69.4	81.3	2.1	9.9	1.5
TRUCKS	88.5	77.0	69.3	79.8	5.2	8.4	3.7
COMBINED	91.3	79.8	69.4	81.1	1.9	9.8	1.4

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

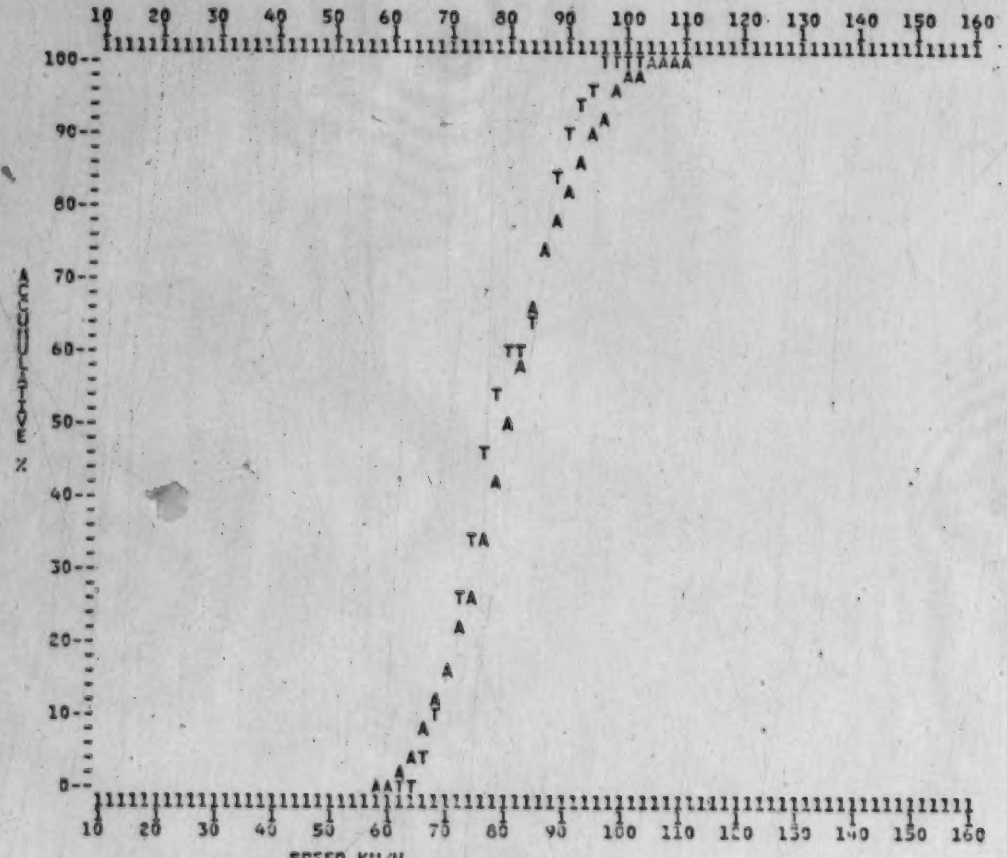
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 241

HIGHWAY 2 . LOCATION 550 M S ENTRANCE LEDUC O/P TYPE OF HIGHWAY SIX LANE DIVIDED

TRAFFIC DENSITY 150 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 90
TRUCKS 80 KM/H TRUCKS 10

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1110 STOP TIME 1150 DIRECTION OF TRAVEL S AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 251

HIGHWAY 2 LOCATION 350 M S ENTRANCE LEDUC O/P TYPE OF HIGHWAY SIX LANE DIVIDED

TRAFFIC DENSITY 153 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 90 TRUCKS 12

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1110 STOP TIME 1150 DIRECTION OF TRAVEL S AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
106	1	0	1	1.0	0.0	1.0	1.12	0.0	0.99	100.00	100.00	100.00
104	2	0	2	1.7	0.0	1.7	1.87	0.0	1.65	98.88	100.00	99.01
102	2	0	2	1.7	0.0	1.7	1.87	0.0	1.65	97.00	100.00	97.35
100	1	0	1	3.7	0.3	3.0	3.00	2.78	2.97	95.13	100.00	95.71
98	3	0	3	3.7	0.3	3.0	3.00	2.78	2.97	92.13	97.22	92.74
96	3	0	3	3.3	0.3	3.3	3.37	2.78	3.30	89.14	94.44	89.77
94	2	0	2	2.0	0.0	2.0	2.25	0.0	1.98	85.77	91.67	86.47
92	3	0	3	2.3	0.3	2.7	2.62	2.78	2.64	83.52	91.67	84.49
90	3	1	4	2.7	1.0	3.7	3.00	8.33	3.63	80.90	88.89	81.85
88	4	1	5	4.0	1.3	5.3	4.49	11.11	5.28	77.90	80.56	78.22
86	6	1	7	5.7	1.0	6.7	6.37	8.33	6.60	73.41	69.44	72.84
84	6	1	7	6.7	0.7	7.3	7.49	5.56	7.26	67.04	61.11	66.34
82	8	0	8	7.3	0.3	7.7	8.24	2.78	7.59	59.55	52.78	59.08
80	8	0	8	7.3	0.7	8.0	8.24	5.56	7.92	51.31	52.78	51.49
78	8	1	9	7.3	1.3	8.7	8.24	11.11	8.58	43.07	47.22	43.56
76	6	1	7	6.3	1.3	7.7	7.12	11.11	7.59	34.83	36.11	34.99
74	5	0	5	6.0	1.3	7.3	6.74	11.11	7.26	27.72	25.00	27.39
72	7	0	7	5.3	0.3	5.7	5.99	2.78	5.61	20.97	13.89	20.13
70	4	0	4	4.3	0.3	4.7	4.87	2.78	4.82	14.98	11.11	14.52
68	2	0	2	3.3	0.0	3.3	3.75	0.0	3.30	10.11	8.33	9.90
66	2	0	2	2.3	0.3	2.7	2.62	2.78	2.64	6.37	8.33	6.60
64	1	1	2	2.3	0.3	2.7	2.62	2.78	2.64	3.75	5.55	3.96
62	1	0	1	1.0	0.3	1.3	1.12	2.78	1.32	1.12	2.78	1.32

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	93.3	79.7	70.0	81.7	2.1	10.3	1.5
TRUCKS	89.1	79.0	72.2	81.2	5.1	9.0	3.6
COMBINED	92.5	79.6	70.2	81.6	2.0	10.2	1.4

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

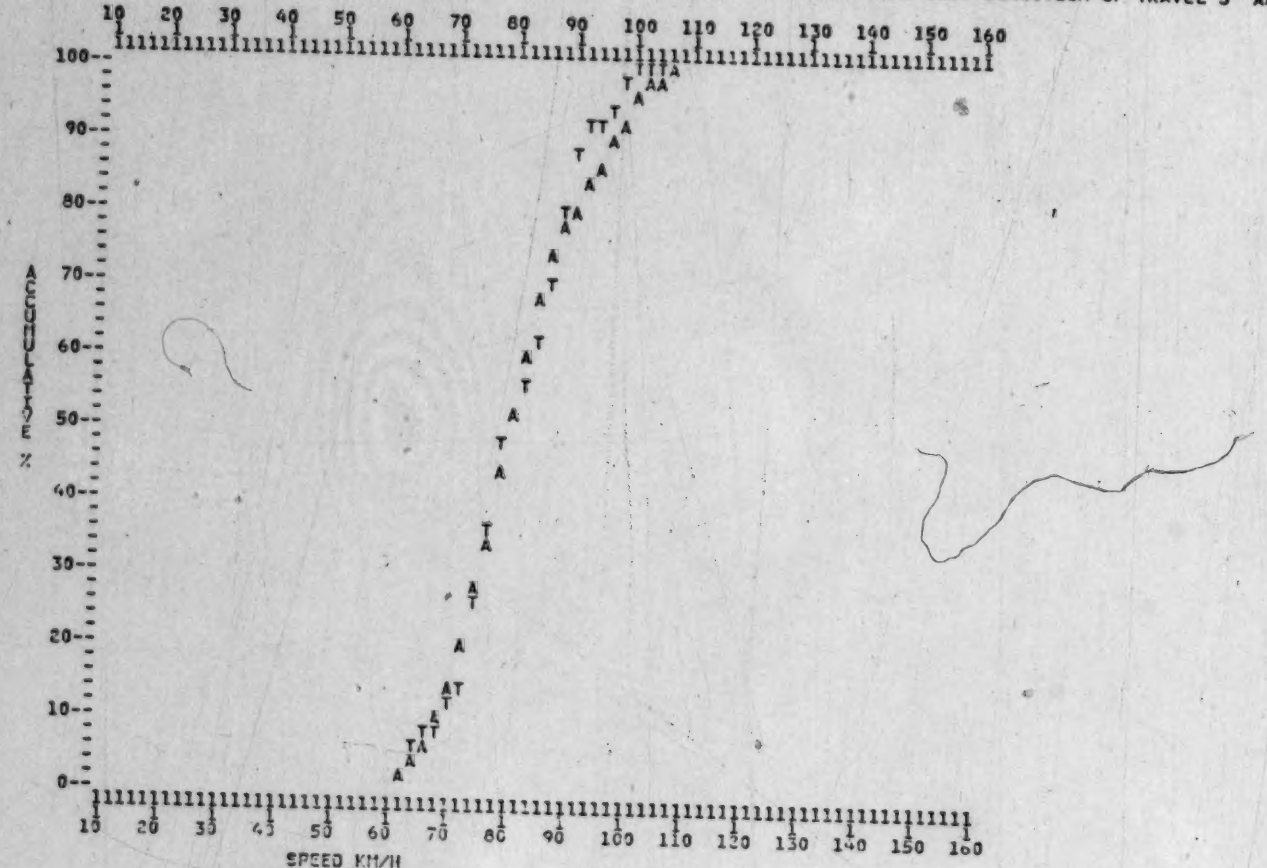
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 251

HIGHWAY 2 LOCATION 350 M S ENTRANCE LEDUC O/P TYPE OF HIGHWAY SIX LANE DIVIDED

TRAFFIC DENSITY 153 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 90
TRUCKS 80 KM/H TRUCKS 12

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1110 STOP TIME 1150 DIRECTION OF TRAVEL S AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 261

HIGHWAY 2 LOCATION 125 M S ENTRANCE LEDUC O/P TYPE OF HIGHWAY SIX LANE DIVIDED

TRAFFIC DENSITY 150 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 91 TRUCKS 9

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1110 STOP TIME 1150 DIRECTION OF TRAVEL S AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
112	2	0	2	1.3	0.0	1.3	1.48	0.0	1.35	100.00	100.00	100.00
110	2	0	2	1.7	0.3	2.0	1.85	3.70	2.02	98.52	100.00	98.65
108	2	0	2	1.7	0.3	2.0	1.85	3.70	2.02	96.67	96.30	96.63
106	2	0	2	1.7	0.3	2.0	1.85	3.70	2.02	94.81	92.59	94.61
104	2	0	2	2.0	0.0	2.0	2.22	0.0	2.02	92.96	88.89	92.59
102	4	0	4	3.0	0.0	3.0	3.33	0.0	3.03	90.00	88.89	89.90
100	3	0	3	4.0	0.0	4.0	4.44	0.0	4.04	86.67	88.89	86.87
98	3	0	3	4.0	0.3	4.0	4.07	3.70	4.04	82.22	88.89	82.83
96	4	0	4	4.0	0.3	4.3	4.44	3.70	4.38	78.15	85.19	78.79
94	4	1	5	5.7	0.7	6.3	6.30	7.41	6.40	73.70	81.48	74.41
92	10	1	11	8.0	0.3	8.3	8.89	3.70	8.42	67.41	74.07	68.01
90	10	0	10	9.7	0.7	10.3	10.74	7.41	10.44	58.52	70.37	59.60
88	9	1	10	8.3	1.0	9.3	9.26	11.11	9.43	47.78	62.96	49.16
86	6	2	8	7.0	1.0	8.0	7.78	11.11	8.03	38.52	51.85	39.73
84	6	1	7	6.0	1.0	7.0	6.67	11.11	7.07	30.74	40.74	31.65
82	6	1	7	6.0	0.7	6.7	6.67	7.41	6.73	24.07	29.63	24.58
80	5	1	6	5.0	0.7	5.7	5.56	7.41	5.72	17.41	22.22	17.85
78	3	1	4	3.7	0.3	4.0	4.07	3.70	4.04	11.85	14.81	12.12
76	2	0	2	2.3	0.3	2.7	2.59	3.70	2.69	7.78	11.11	8.09
74	2	0	2	2.0	0.3	2.3	2.22	3.70	2.32	5.19	7.41	5.39
72	1	0	1	1.7	0.3	2.0	1.85	3.70	2.02	2.96	3.70	3.03
70	1	0	1	1.0	0.0	1.0	1.11	0.0	1.01	1.11	0.00	1.01

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	99.3	88.4	79.1	89.9	1.9	9.3	1.4
TRUCKS	95.9	85.7	78.0	89.0	6.2	9.5	4.4
COMBINED	99.1	88.2	79.0	89.7	1.8	9.3	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

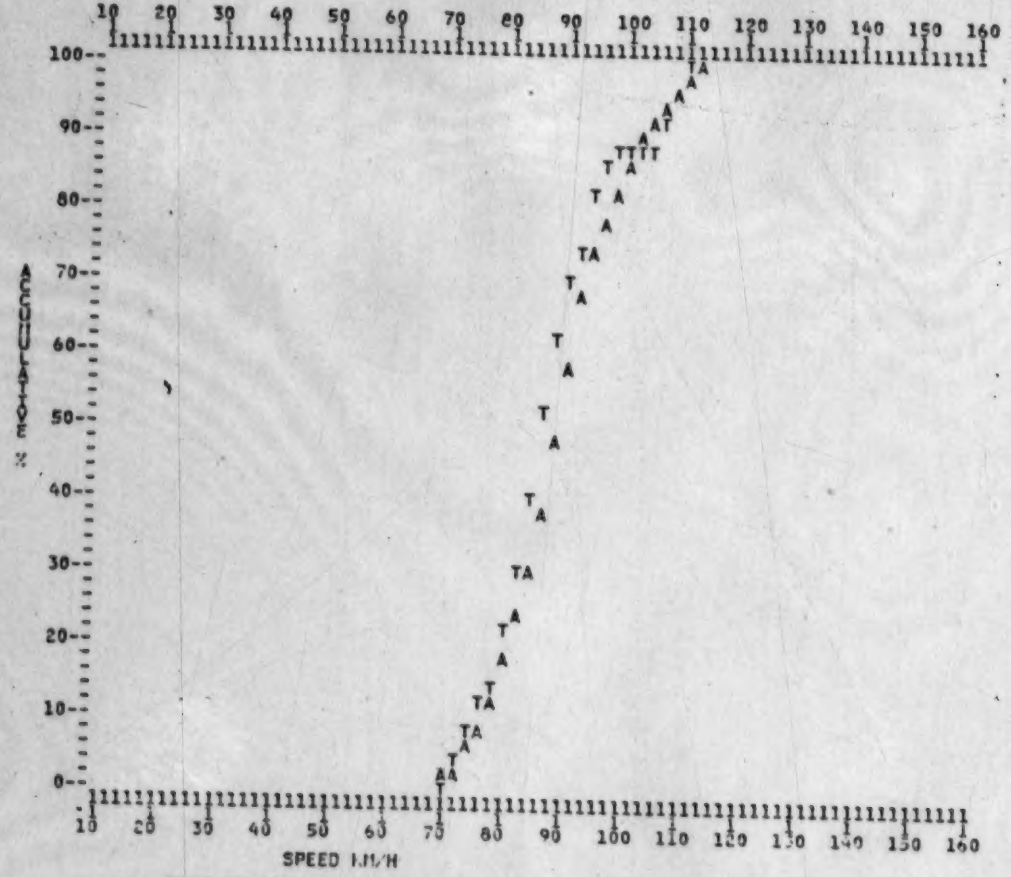
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 261

HIGHWAY 2 LOCATION 125 M S ENTRANCE LEDUC O/P TYPE OF HIGHWAY SIX LANE DIVIDED

TRAFFIC DENSITY 150 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H SAMPLE SIZE AUTOS 91
TRUCKS 80 KM/H TRUCKS 9

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 1110 STOP TIME 1150 DIRECTION OF TRAVEL S AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

APPENDIX 5

EXIT TERMINAL 2

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1700

HIGHWAY 14 LOCATION HWY 14 S RAMP 500 M W 17 ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 240 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 44 TRUCKS 16

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1325 STOP TIME 1340 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
94	3	1	4	1.3	0.3	1.7	3.10	2.17	2.86	100.00	100.00	100.00
92	1	0	1	1.7	0.3	2.0	2.99	2.17	3.43	96.90	97.83	97.14
90	1	0	1	1.0	0.0	1.0	2.33	0.0	1.71	93.02	95.65	93.71
88	1	0	1	1.0	0.0	1.0	2.33	0.0	1.71	90.70	95.65	92.00
86	1	0	1	1.0	0.0	1.0	2.33	0.0	1.71	88.37	95.65	90.29
84	2	0	2	2.7	0.3	3.0	4.99	0.0	3.43	86.04	95.65	88.57
82	3	1	4	3.7	0.3	4.0	6.60	2.17	5.14	81.05	93.48	85.14
80	3	1	4	4.3	1.0	5.3	8.53	4.35	6.86	74.45	91.31	81.71
78	3	1	4	4.3	1.0	5.3	7.75	6.52	7.43	65.92	89.13	74.29
76	3	1	4	4.3	1.7	6.0	7.75	6.52	7.43	58.14	82.61	66.86
74	3	1	4	5.0	1.7	6.7	7.75	10.87	8.57	51.24	76.09	59.43
72	3	1	4	5.0	1.7	6.7	7.75	10.87	8.57	43.41	65.22	50.86
70	3	1	4	5.3	1.7	7.0	8.53	10.87	9.14	35.66	54.35	42.29
68	3	1	4	4.7	1.3	6.0	7.75	8.70	8.00	27.91	43.48	33.14
66	2	1	3	4.3	1.3	5.7	6.98	8.70	7.43	20.16	34.78	25.14
64	2	0	2	3.0	1.3	4.3	3.88	8.70	5.14	13.18	26.09	17.71
62	2	0	2	2.3	1.0	3.3	3.10	6.52	4.00	9.30	17.39	12.57
60	2	0	2	2.0	0.7	2.7	3.10	4.35	3.43	6.20	10.87	8.57
58	1	0	1	1.7	0.3	2.0	3.10	2.17	2.86	3.10	6.52	5.14
56	0	0	0	0.7	0.0	0.7	1.55	0.0	1.14	0.0	4.35	2.29
54	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.35	1.14
52	0	1	1	0.0	0.3	0.3	0.0	2.17	0.57	-0.00	4.35	1.14
							0.0	2.17	0.57	-0.00	2.17	0.57

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	84.6	75.1	66.1	76.2	2.6	8.8	1.9
TRUCKS	78.7	71.2	63.3	72.1	4.1	8.2	2.9
COMBINED	83.3	73.8	64.9	75.1	2.3	8.8	1.6

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

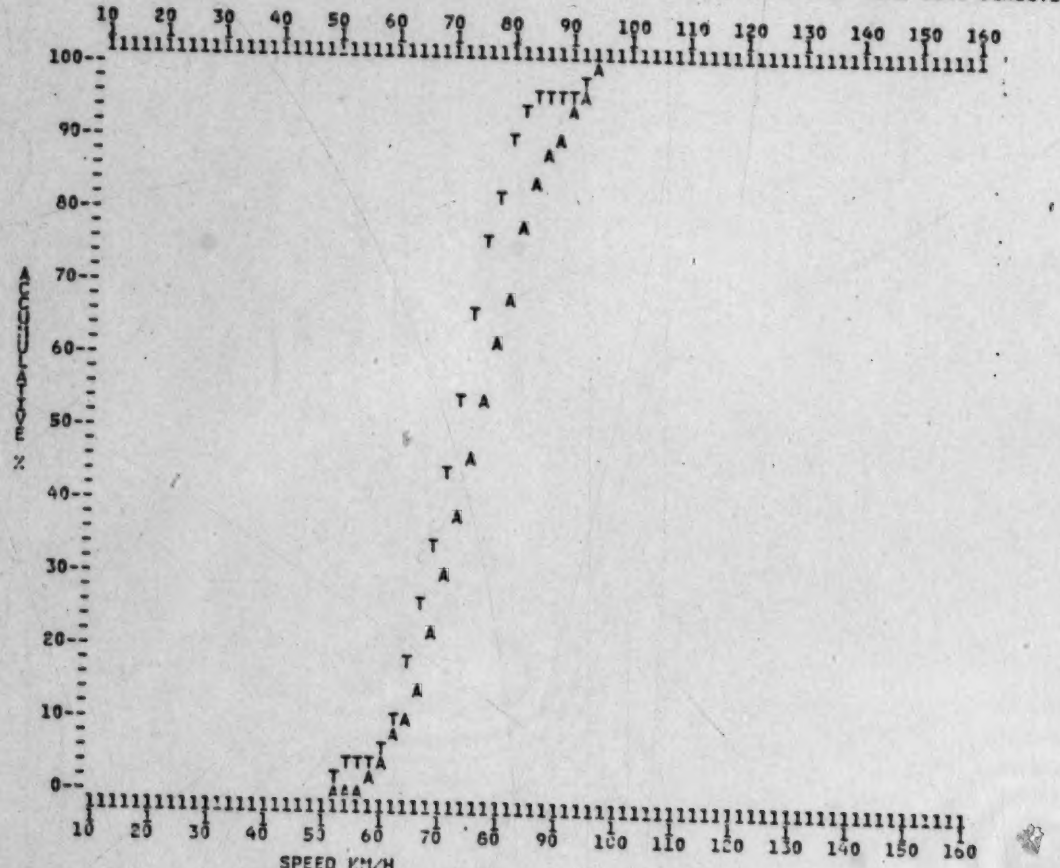
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1700

HIGHWAY 14 LOCATION HWY 14 S RAMP 500 M W 17 ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 240 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 44 TRUCKS 16

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1325 STOP TIME 1340 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1710

HIGHWAY 14 LOCATION HWY 14 RAMP 300 M W 17 ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 240 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 51 TRUCKS 9

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1350 STOP TIME 14 5 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
94	1	0	1	0.7	0.0	0.7	1.32	0.0	1.13	100.00	100.00	100.00
92	1	0	1	0.7	0.0	0.7	1.32	0.0	1.13	98.68	100.00	98.87
90	1	0	1	0.7	0.0	0.7	1.32	0.0	1.13	97.33	100.00	97.74
88	1	0	1	0.7	0.0	0.7	1.32	0.0	1.13	96.03	100.00	96.61
86	1	0	1	1.0	0.0	1.0	1.99	0.0	1.69	94.70	100.00	95.48
84	1	0	1	1.3	0.0	1.3	2.65	0.0	2.26	92.73	100.00	93.79
82	2	0	2	3.0	0.0	3.0	5.96	0.0	5.08	90.07	100.00	91.53
80	6	0	6	5.0	0.3	5.3	9.93	3.85	9.04	84.11	100.00	85.44
78	7	0	8	5.0	0.3	5.3	9.93	3.85	9.04	74.17	96.15	77.40
76	2	0	2	4.0	0.3	4.3	7.95	3.85	7.34	64.24	92.31	68.36
74	3	0	3	2.7	0.3	3.0	5.30	3.85	5.08	56.29	88.46	61.02
72	3	1	4	3.7	0.7	4.3	7.28	7.69	7.34	50.99	84.62	55.93
70	5	1	6	4.7	0.7	5.3	9.27	7.69	9.04	43.71	76.92	48.59
68	2	1	3	4.3	0.7	5.0	8.61	7.69	8.47	34.44	69.23	39.55
66	2	1	3	3.7	0.7	4.3	7.28	7.69	7.34	25.83	61.54	31.07
64	3	1	4	3.3	1.7	5.0	6.62	19.23	8.47	18.54	53.85	23.73
62	2	1	3	2.7	1.3	4.0	5.30	15.38	6.79	11.92	34.62	15.25
60	1	0	1	1.7	1.0	2.7	3.31	11.54	4.52	6.63	19.23	8.47
58	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	3.31	7.69	3.95
56	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	3.31	7.69	3.95
54	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	3.31	7.69	3.95
52	1	0	1	0.7	0.0	0.3	0.66	0.0	0.56	3.31	7.69	3.95
50	1	1	2	0.7	0.3	1.0	1.32	3.85	1.69	1.32	3.85	1.69

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	80.3	71.7	62.9	72.9	2.4	8.7	1.7
TRUCKS	72.2	63.6	59.3	65.8	4.6	7.0	3.3
COMBINED	79.7	70.4	61.9	71.9	2.3	8.9	1.6

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

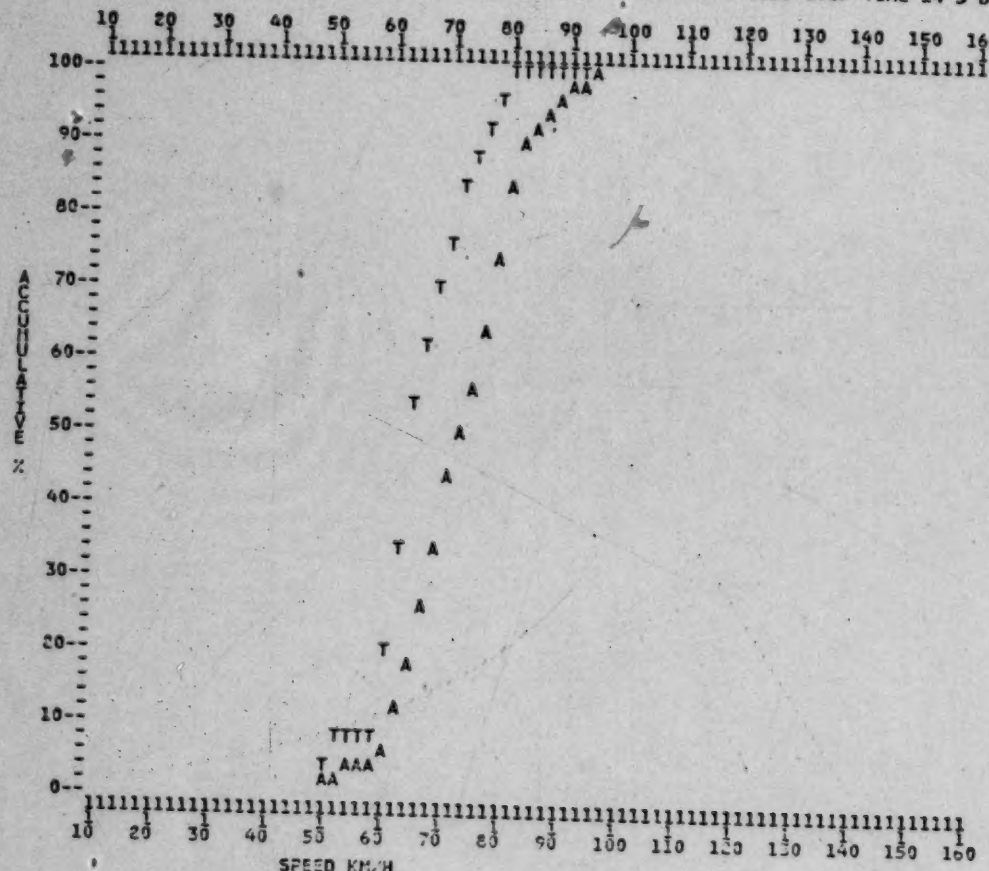
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1710

HIGHWAY 14 LOCATION HWY 14 RAMP 300 M W 17 ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 240 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 51
TRUCKS 60 KM/H TRUCKS 9

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1350 STOP TIME 14 5 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1720

HIGHWAY 14 LOCATION HWY 14 S RMP S LNE 20M W 17ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 144 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 50 TRUCKS 10

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1420 STOP TIME 1445 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
76	1	0	1	0.3	0.0	0.3	0.68	0.0	0.56	100.00	100.00	100.00
74	0	0	0	0.7	0.0	0.7	1.35	0.0	1.12	99.32	100.00	99.44
72	1	0	1	0.3	0.0	0.3	0.68	0.0	0.56	97.97	100.00	98.31
70	0	0	0	0.7	0.3	1.0	1.35	3.33	1.69	97.30	100.00	97.75
68	1	1	2	1.0	0.3	1.3	2.03	3.33	2.25	95.95	96.67	96.07
66	2	0	2	1.7	1.0	2.7	3.38	10.00	4.49	93.92	93.33	93.82
64	2	0	4	3.7	0.7	3.3	5.41	6.67	5.62	90.54	83.33	89.33
62	4	0	4	3.7	1.0	4.7	7.43	10.00	7.87	85.14	76.67	83.71
60	2	1	6	4.7	0.7	5.3	9.46	6.67	8.99	77.70	66.67	75.84
58	3	0	6	4.3	0.7	5.0	8.78	6.67	8.43	68.24	60.00	66.85
56	3	0	6	4.7	0.3	5.0	9.46	3.33	8.43	59.46	53.33	58.43
54	6	0	6	5.0	0.7	5.7	10.14	6.67	9.55	50.00	50.00	50.00
52	6	2	8	5.7	1.0	6.7	11.49	10.00	11.24	39.86	43.33	40.45
50	5	1	6	4.3	1.3	5.7	8.78	13.33	9.55	28.38	33.33	29.21
48	2	1	3	3.0	1.0	4.0	6.03	10.00	6.74	19.59	20.00	19.66
46	2	1	3	2.3	0.7	3.0	4.73	6.67	5.06	13.51	10.00	12.92
44	3	0	3	2.0	0.3	2.3	4.05	3.33	3.93	8.78	3.33	7.87
42	1	0	1	1.7	0.0	1.7	3.33	0.0	2.81	4.72	0.00	3.93
40	1	0	1	0.7	0.0	0.7	1.35	0.0	1.12	1.35	0.00	1.12

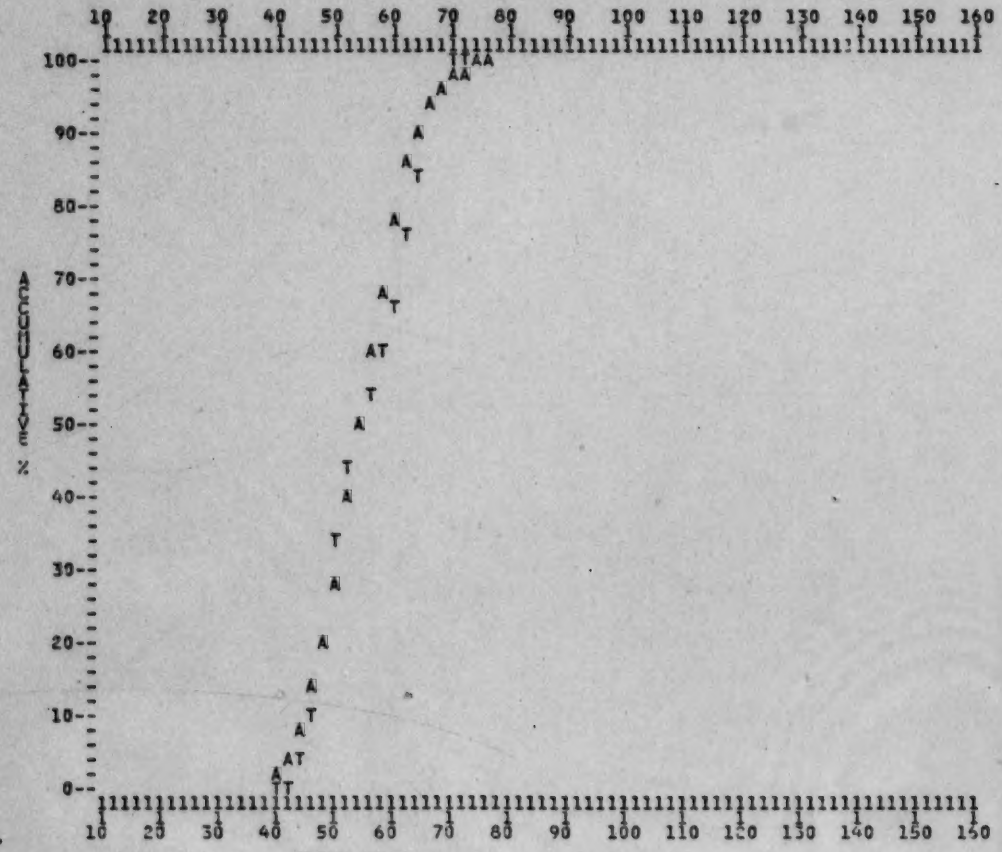
	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	62.0	54.0	46.5	55.4	2.1	7.4	1.5
TRUCKS	64.3	54.0	47.0	56.2	4.6	7.4	3.3
COMBINED	62.5	54.0	46.6	55.5	1.9	7.4	1.3

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

HIGHWAY 14 LOCATION HWY 14 S RMP S LNE 20M W 17ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 144 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 50 TRUCKS 10

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1420 STOP TIME 1445 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED

A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1730

HIGHWAY 14 LOCATION HWY 14 S RMP N LNE 10N W 17ST TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 120 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 40 TRUCKS 20

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1450 STOP TIME 1520 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
72	1	0	1	0.3	0.0	0.3	0.84	0.0	0.56	100.00	100.00	100.00
70	0	0	0	0.3	0.0	0.3	0.84	0.0	0.56	99.16	100.00	99.44
68	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	98.32	100.00	98.88
66	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	98.32	100.00	98.88
64	0	0	0	0.7	0.0	0.7	1.68	0.0	1.12	98.32	100.00	98.88
62	2	0	2	0.7	0.0	0.7	1.68	0.0	1.12	96.64	100.00	97.77
60	0	0	0	0.7	0.0	0.7	1.68	0.0	1.12	94.96	100.00	96.65
58	0	0	0	1.0	0.3	1.3	2.52	1.69	2.25	93.28	100.00	95.51
56	3	1	4	1.7	0.3	2.0	4.20	1.69	3.37	90.76	98.31	93.26
54	3	0	3	3.0	0.3	3.3	7.55	1.69	5.62	86.56	96.61	89.89
52	4	0	4	3.7	0.3	4.0	9.24	1.69	6.74	78.99	94.92	84.27
50	2	0	2	3.7	0.3	4.0	5.04	1.69	3.93	69.75	93.22	77.53
48	5	1	6	4.3	0.3	4.7	8.24	1.69	6.18	64.71	91.53	73.60
46	2	0	2	4.3	0.3	4.7	5.04	1.69	3.93	56.47	89.83	67.42
44	4	0	4	4.3	0.3	4.7	10.92	1.69	7.30	51.43	88.14	63.48
42	3	0	3	4.3	0.3	4.7	7.55	1.69	5.62	40.55	86.44	56.18
40	2	1	3	4.3	0.3	4.7	5.04	1.69	3.93	32.99	84.75	50.56
38	1	1	2	4.3	0.3	4.7	2.52	1.69	2.25	27.95	83.05	46.63
36	1	1	2	4.3	0.3	4.7	2.52	1.69	2.25	25.43	81.36	44.38
34	1	1	2	4.3	0.3	4.7	2.52	1.69	2.25	22.91	79.66	42.13
32	1	1	2	4.3	0.3	4.7	2.52	1.69	2.25	20.39	77.97	39.89
30	0	1	1	4.3	0.3	4.7	2.52	1.69	2.25	17.87	76.27	37.64
28	0	1	1	4.3	0.3	4.7	2.52	1.69	2.25	15.34	74.58	35.39
26	0	1	1	4.3	0.3	4.7	2.52	1.69	2.25	12.82	72.88	33.15
24	0	1	1	4.3	0.3	4.7	2.52	1.69	2.25	10.30	71.19	30.90
22	0	1	1	4.3	0.3	4.7	2.52	1.69	2.25	7.78	69.49	28.65
20	0	1	1	4.3	0.3	4.7	2.52	1.69	2.25	5.25	67.80	26.40
18	0	1	1	4.3	0.3	4.7	2.52	1.69	2.25	2.73	66.10	24.16
16	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.21	64.41	21.91
14	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.0	62.71	19.66
12	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.0	61.02	17.42
10	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.0	59.32	15.17
8	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.0	57.63	12.92
6	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.0	55.93	10.67
4	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.0	54.24	8.43
2	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.0	52.54	6.18
0	0	1	1	4.3	0.3	4.7	2.52	1.69	2.25	0.0	50.85	3.93
-2	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.0	49.15	1.69
-4	0	0	0	4.3	0.3	4.7	2.52	1.69	2.25	0.0	47.46	0.0

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	53.6	45.7	38.8	47.2	2.4	7.8	1.7
TRUCKS	50.1	41.0	29.9	41.4	3.8	8.5	2.7
COMBINED	52.7	44.5	35.4	45.3	2.2	8.5	1.5

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

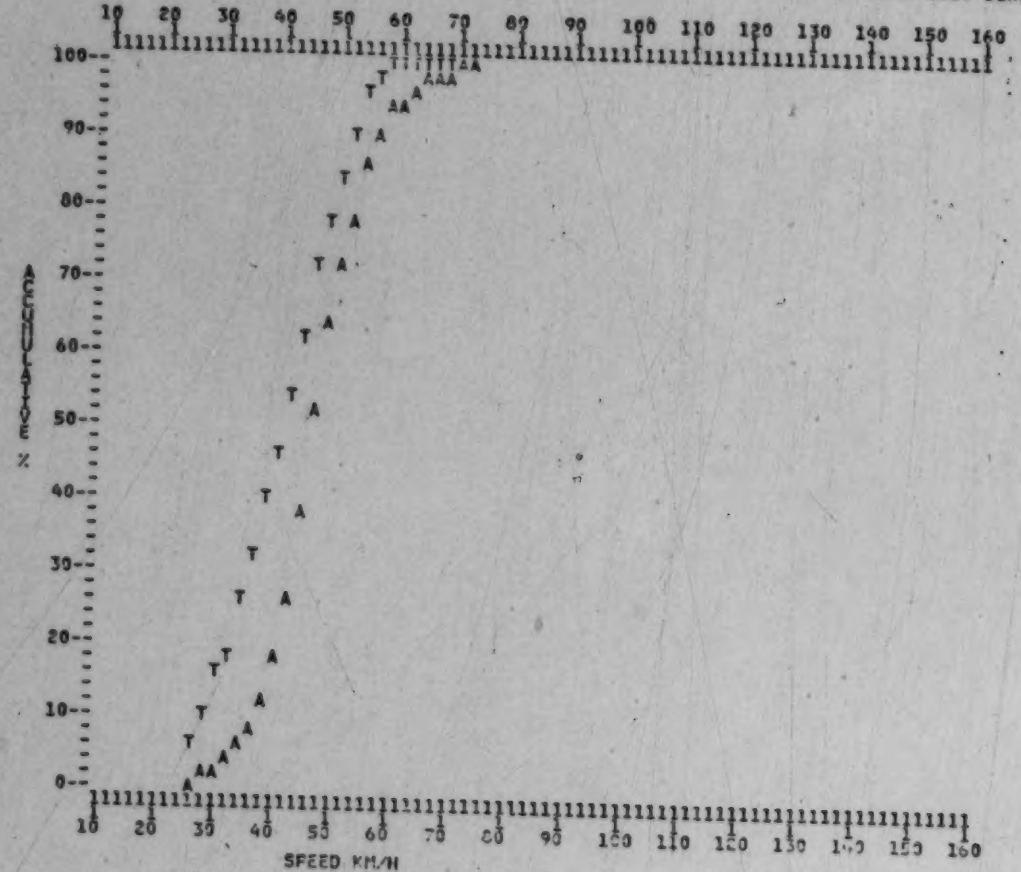
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1730

HIGHWAY 14 LOCATION HWY 14 S RMP N LNE 10M W 173T TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 120 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 40
TRUCKS 60 KM/H TRUCKS 20

DATE 6 5 80 LIGHT CONDITIONS-- DAY START TIME 1450 STOP TIME 1520 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1700

HIGHWAY 14 LOCATION 500 M W 17 ST O/P S RAMP TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 166 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 75 TRUCKS 22

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 855 STOP TIME 930 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
100	1	0	1	1.0	0.0	1.0	1.35	0.0	1.05	100.00	100.00	100.00
98	1	0	1	1.0	0.0	1.0	1.35	0.0	1.05	98.65	100.00	98.95
96	1	0	1	1.0	0.0	1.0	1.35	0.0	1.05	97.30	100.00	97.90
94	0	0	0	0.7	0.0	0.7	0.00	0.0	0.70	95.90	100.00	96.80
92	1	0	1	1.0	0.0	1.0	1.35	0.0	1.05	94.59	100.00	95.80
90	2	0	2	1.3	0.0	1.3	4.50	0.0	2.50	93.24	100.00	94.75
88	7	0	7	4.7	0.0	4.7	6.31	0.0	4.90	88.74	100.00	91.25
86	5	0	5	5.0	0.0	5.0	9.76	0.0	5.24	82.43	100.00	86.33
84	4	0	4	4.3	0.7	5.0	5.89	3.12	5.24	75.68	100.00	81.15
82	5	2	7	4.3	0.7	5.0	5.66	3.12	5.24	69.82	96.87	75.91
80	5	0	5	6.0	1.7	7.7	8.11	7.81	8.04	63.29	93.75	70.68
78	8	3	11	5.3	1.0	6.3	7.21	4.69	6.64	55.22	85.94	62.59
76	3	0	3	6.7	1.3	8.0	9.01	6.25	8.39	48.65	81.25	55.64
74	9	1	10	5.3	1.0	6.3	7.21	4.69	6.64	39.64	75.00	47.55
72	4	2	6	5.7	1.7	7.3	7.66	7.81	7.69	32.43	70.31	40.91
70	4	2	6	4.3	2.0	6.3	5.66	9.37	6.64	24.77	62.50	33.26
68	5	2	7	4.3	2.0	6.3	5.66	9.37	6.64	18.92	53.13	26.57
66	4	2	6	3.0	2.3	5.3	4.05	10.94	5.59	13.06	43.75	19.93
64	0	3	3	2.0	2.3	4.3	2.70	10.94	4.55	9.01	32.81	14.34
62	2	1	3	1.3	2.0	3.3	1.80	9.37	3.50	6.31	21.88	9.79
60	2	1	3	1.0	1.7	2.7	1.80	7.81	3.86	4.50	12.50	6.29
58	2	2	4	1.3	1.0	2.3	1.80	4.69	2.45	1.80	4.69	2.45

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	86.8	76.4	66.7	77.7	2.2	9.4	1.5
TRUCKS	77.6	67.3	60.5	69.3	3.0	7.1	2.1
COMBINED	85.5	74.6	64.2	75.8	1.9	9.6	1.4

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

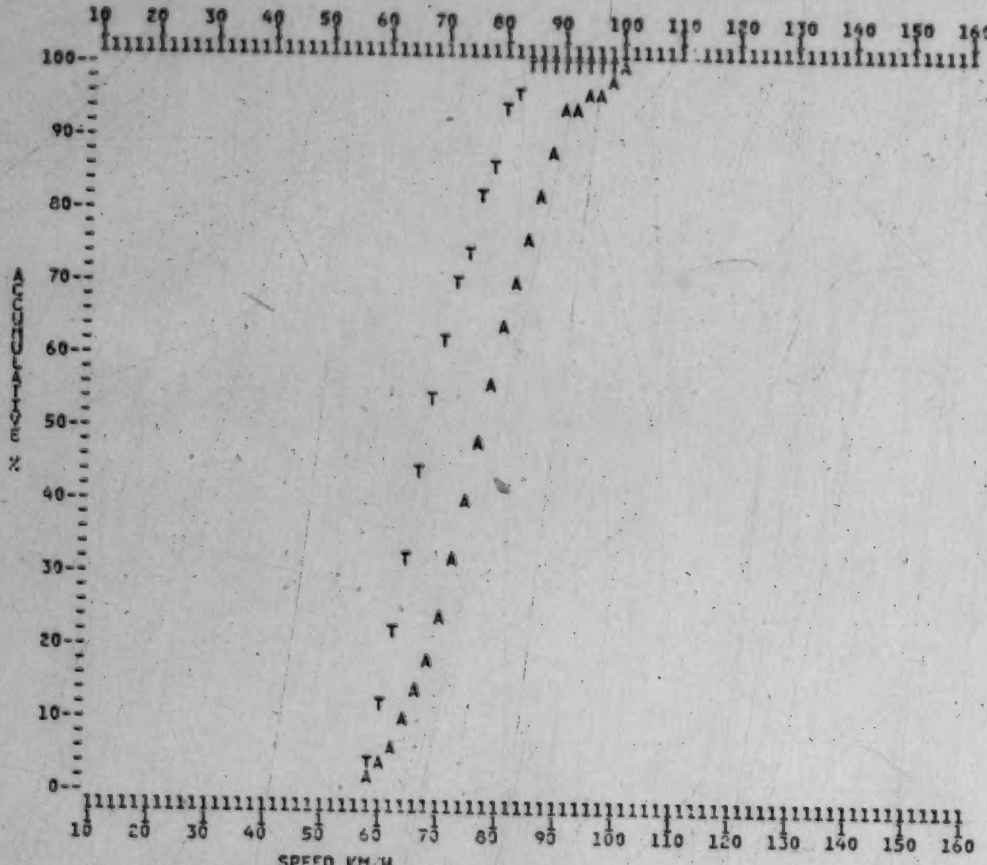
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1700

HIGHWAY 14 LOCATION 500 M W 17 ST O/P S RAMP TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 166 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 75
TRUCKS 60 KM/H TRUCKS 22

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 855 STOP TIME 930 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1710

HIGHWAY 14 LOCATION 300 M W 17 ST O/P S RAMP TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 178 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 84 TRUCKS 20

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 855 STOP TIME 930 DIRECTION OF TRAVEL E AADT

SPEED CLASS K.M/H.	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
86	2	0	2	1.0	0.0	1.0	1.20	0.0	0.97	100.00	100.00	100.00
84	2	0	2	1.0	0.0	1.0	1.20	0.0	0.97	98.80	100.00	99.03
82	1	0	1	0.7	0.0	0.7	0.60	0.0	0.65	97.59	100.00	98.06
80	2	0	2	1.0	0.0	1.0	1.20	0.0	0.97	96.79	100.00	97.41
78	4	0	4	2.0	0.0	2.0	2.41	0.0	1.94	95.58	100.00	96.44
76	5	0	5	2.7	0.0	2.7	3.21	0.0	2.53	93.17	100.00	94.50
74	5	0	5	2.3	0.0	2.3	2.81	0.0	2.27	89.96	100.00	91.91
72	4	0	4	3.7	0.0	3.7	4.42	0.0	3.56	87.15	100.00	89.64
70	7	0	7	5.3	0.3	5.7	6.43	1.67	5.50	82.73	100.00	86.08
68	8	1	9	7.0	1.3	8.3	8.43	6.67	8.09	79.31	98.33	80.53
66	9	1	9	8.3	1.3	10.0	10.04	8.33	9.71	67.87	91.67	72.49
64	11	1	12	8.3	1.3	9.7	10.04	6.67	9.39	57.83	83.33	62.78
62	8	1	8	8.0	0.7	8.7	9.64	5.33	8.41	47.79	76.67	53.40
60	8	1	8	7.3	1.3	8.7	8.84	6.67	8.41	38.15	73.33	44.98
58	5	1	12	6.7	1.3	8.0	8.03	6.67	8.09	29.52	66.67	36.57
56	6	0	7	6.7	2.0	8.7	8.03	15.00	9.39	21.38	60.00	28.80
54	5	0	11	5.5	2.0	7.3	6.43	10.00	7.12	13.35	45.00	19.42
52	3	0	5	3.3	1.7	6.0	4.02	13.33	6.15	6.93	35.00	12.37
50	1	0	2	1.7	1.0	2.7	2.01	5.00	2.59	2.91	21.67	6.47
48	0	0	1	0.0	1.3	1.3	0.0	8.67	1.62	0.80	16.67	3.88
46	0	0	1	0.0	1.0	1.0	0.0	5.00	0.97	0.80	10.00	2.59
44	0	0	1	0.0	0.7	0.7	0.0	3.33	0.65	0.80	5.00	1.62
42	0	0	0	0.0	0.3	0.3	0.0	1.67	0.32	0.80	1.67	0.97
40	0	0	0	0.3	0.0	0.3	0.40	0.0	0.32	0.80	0.00	0.65
38	1	0	1	0.3	0.0	0.3	0.40	0.0	0.32	0.40	0.00	0.32

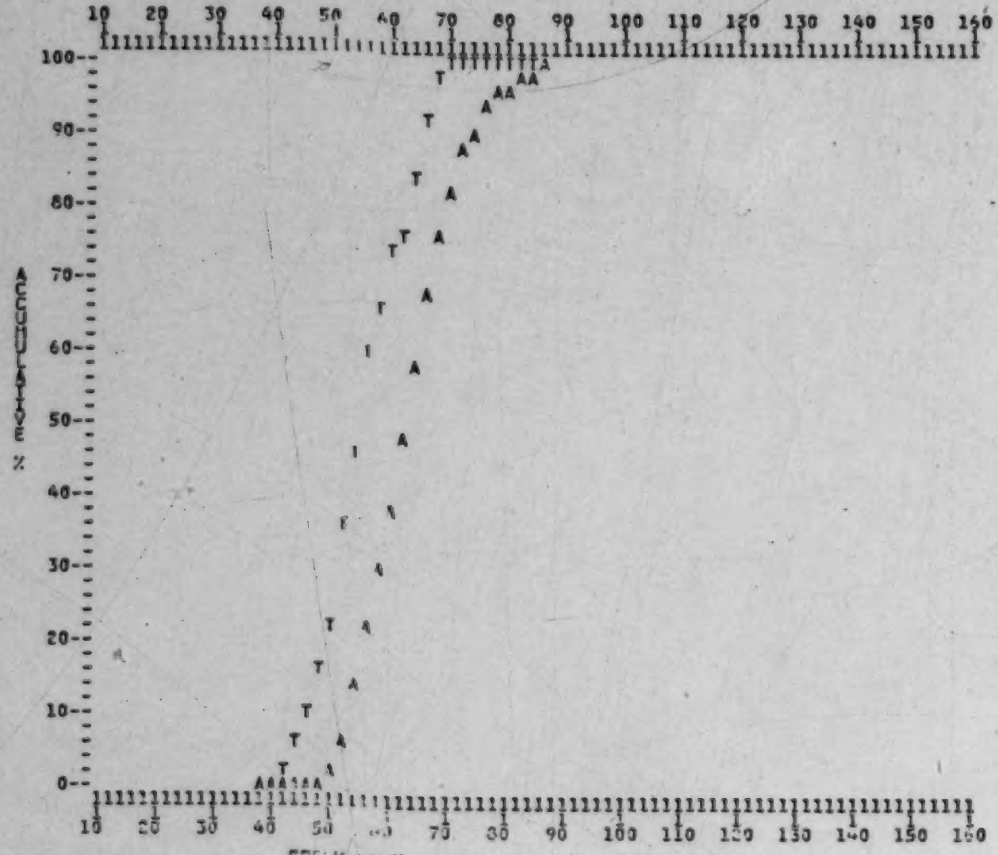
	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	71.0	62.4	54.4	63.8	1.8	8.1	1.2
TRUCKS	64.4	54.7	47.5	56.3	3.1	7.0	2.2
COMBINED	69.6	61.2	52.8	62.4	1.6	8.5	1.2

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

HIGHWAY 14 LOCATION 300 M W 17 ST O/P S RAMP TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 178 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 84 TRUCKS 20

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 855 STOP TIME 930 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED

A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1720

HIGHWAY 14 LOCATION 20 M W 17 ST O/P S RMP S LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 87 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 43 TRUCKS 8

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 855 STOP TIME 930 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
74	2	0	2	0.7	0.0	0.7	1.59	0.0	1.34	100.00	100.00	100.00
72	2	0	2	0.7	0.0	0.7	1.59	0.0	1.34	98.41	100.00	98.66
70	1	0	1	0.3	0.0	0.3	0.79	0.0	0.67	96.83	100.00	97.32
68	2	0	2	1.0	0.0	1.0	1.59	0.0	1.34	95.03	100.00	96.64
66	3	0	3	1.3	0.0	1.3	2.37	0.0	2.01	93.65	100.00	95.30
64	4	0	4	1.3	0.0	1.3	3.17	0.0	2.68	91.28	100.00	94.63
62	4	0	4	1.3	0.0	1.3	3.17	0.0	2.68	88.11	100.00	91.95
60	3	0	3	1.3	0.0	1.3	2.38	0.0	2.01	84.92	100.00	89.26
58	5	0	5	2.0	0.0	2.0	3.96	0.0	3.36	82.54	100.00	87.25
56	5	0	5	2.3	0.0	2.3	3.96	0.0	3.36	78.57	100.00	83.89
54	5	0	5	2.3	0.0	2.3	3.96	0.0	3.36	74.60	100.00	80.54
52	4	0	4	2.3	0.0	2.3	3.17	0.0	2.68	70.63	100.00	77.18
50	6	2	8	3.0	0.7	3.7	4.76	25.00	8.05	67.46	100.00	74.50
48	5	2	7	3.0	0.7	3.7	3.96	25.00	7.38	62.70	75.00	66.44
46	5	2	7	3.0	0.7	3.7	3.96	25.00	7.38	58.73	50.00	59.06
44	5	2	7	3.0	0.7	3.7	3.96	25.00	7.38	54.76	25.00	51.68
42	5	1	6	3.0	0.7	3.7	3.96	12.50	6.04	50.79	0.00	44.30
40	3	0	3	2.3	0.7	2.3	2.38	0.0	2.01	46.83	0.00	38.26
38	1	0	1	1.3	0.0	1.3	0.79	0.0	0.67	44.44	0.00	36.24
36	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	43.65	0.00	35.57
34	1	1	2	0.7	0.3	1.0	0.79	12.50	2.68	43.65	0.00	35.57
				0.3	0.3	0.7	0.79	4.35	1.34	42.86	0.00	32.89

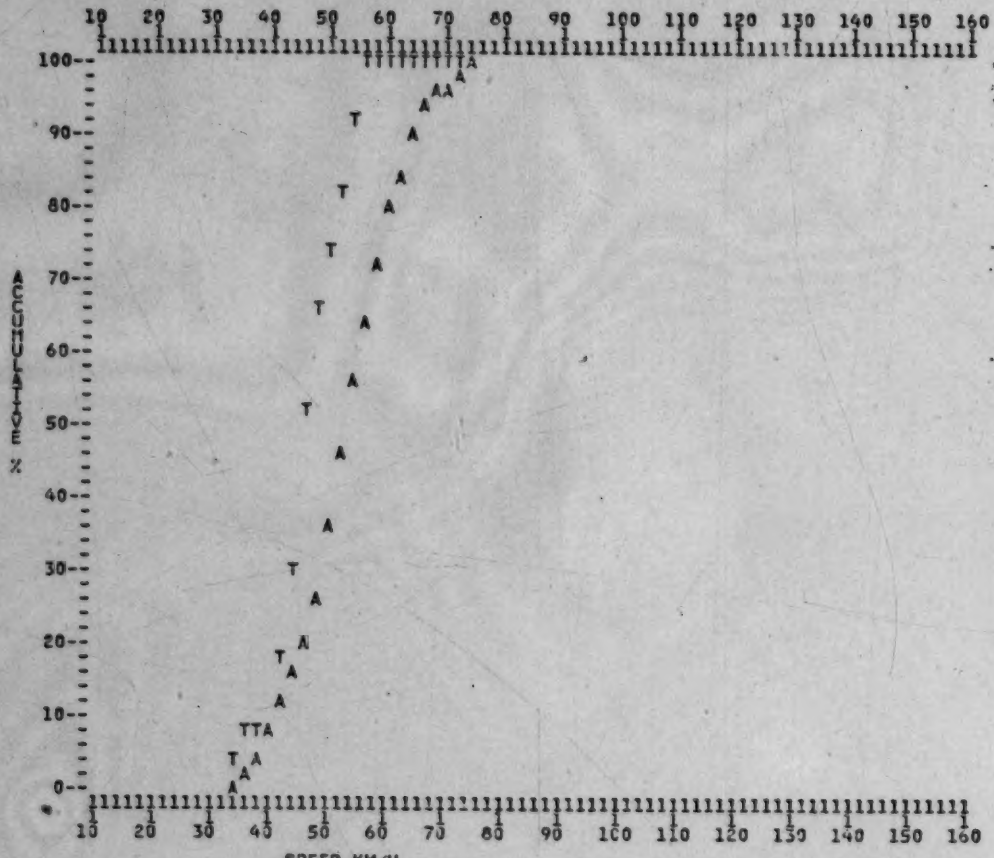
	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	62.0	52.8	43.6	54.0	2.6	8.5	1.8
TRUCKS	52.5	45.8	41.4	47.1	3.9	5.5	2.8
COMBINED	61.0	51.7	43.0	52.9	2.4	8.5	1.7

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

HIGHWAY 14 LOCATION 20 M W 17 ST O/P S RMP S LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 87 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 43
TRUCKS 60 KM/H TRUCKS 8

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 855 STOP TIME 930 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1730

HIGHWAY 14 LOCATION 10 M W 17 ST O/P S RMP N LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 84 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H SAMPLE SIZE AUTOS 36
TRUCKS 60 KM/H TRUCKS 13

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 855 STOP TIME 930 DIRECTION OF TRAVEL E AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
64	2	0	2	0.7	0.0	0.7	1.89	0.0	1.39	100.00	100.00	100.00
62	0	0	0	0.7	0.0	0.7	1.89	0.0	1.39	98.11	100.00	98.61
60	0	0	0	0.3	0.0	0.3	0.94	0.0	0.69	96.23	100.00	97.22
58	1	0	1	1.0	0.0	1.0	2.83	0.0	2.08	95.28	100.00	96.53
56	1	0	1	1.3	0.3	1.7	2.83	2.63	2.77	92.45	100.00	94.44
54	1	1	2	1.7	0.7	2.3	2.72	2.56	4.86	89.62	97.37	90.97
52	2	1	3	1.7	0.7	2.3	4.72	2.56	4.89	83.96	92.11	86.11
50	2	0	2	1.7	0.7	2.3	4.72	2.56	4.89	79.25	89.64	81.25
48	1	1	2	2.0	0.7	2.7	4.72	2.56	4.89	74.53	81.58	76.39
46	3	1	4	3.3	0.7	4.0	5.69	5.56	5.56	68.87	76.32	70.83
44	4	0	4	4.3	0.7	5.0	7.43	5.56	8.33	59.43	71.05	62.50
42	4	1	5	4.7	1.0	5.7	12.26	5.26	10.42	47.17	65.79	53.03
40	4	2	6	4.7	1.0	5.7	13.21	7.89	11.81	33.96	57.90	40.28
38	1	0	1	3.0	1.0	4.0	8.49	7.89	8.33	25.47	50.00	31.94
36	2	1	3	2.3	1.0	3.3	6.60	7.89	9.04	18.87	42.11	25.00
34	2	1	3	2.0	0.7	2.7	5.22	5.26	5.56	13.21	35.84	19.44
32	2	1	3	1.7	1.0	2.7	4.72	7.89	5.56	8.49	30.65	13.89
30	1	1	2	1.3	1.0	2.3	3.77	7.89	4.86	4.72	21.05	9.03
28	0	1	1	0.3	1.0	1.3	0.94	7.89	2.78	3.77	13.16	7.25
26	1	0	1	0.7	0.7	1.3	1.89	5.26	2.78	1.89	7.90	4.47
24	0	0	0	0.3	0.3	0.7	0.94	2.63	1.39	0.94	5.25	2.03
22	0	1	1	0.0	0.3	0.3	0.0	2.63	0.69	-0.00	2.63	0.69

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	52.4	42.5	34.6	44.1	2.7	8.3	1.9
TRUCKS	49.3	38.0	28.5	39.3	4.9	9.0	3.5
COMBINED	51.5	41.6	32.4	42.8	2.5	8.8	1.8

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

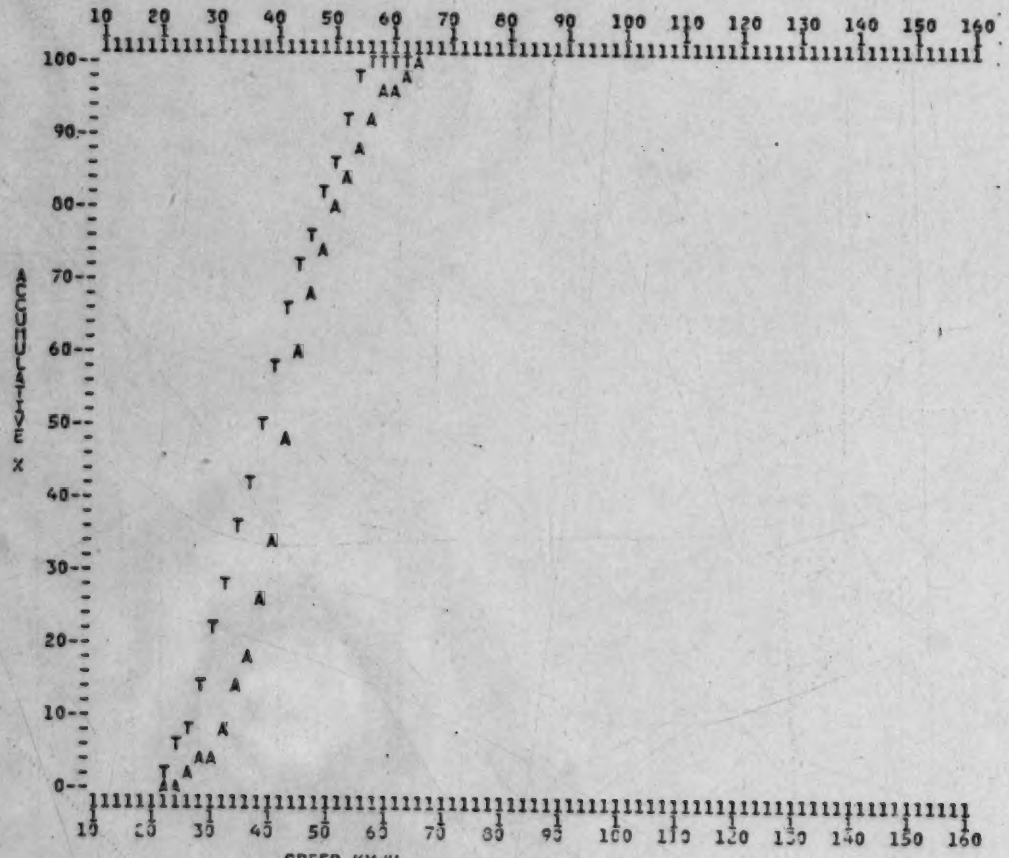
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1730

HIGHWAY 14 LOCATION 10 M W 17 ST O/P S RMP N LANE TYPE OF HIGHWAY FOUR LANE DIVIDE

TRAFFIC DENSITY 84 VEHICLES PER HOUR SPEED LIMIT AUTOS 60 KM/H TRUCKS 60 KM/H SAMPLE SIZE AUTOS 74 TRUCKS 13

DATE 8 5 80 LIGHT CONDITIONS-- DAY START TIME 855 STOP TIME 930 DIRECTION OF TRAVEL E AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

APPENDIX 6

EXIT TERMINAL 3

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION NE RAMP .4KM NORTH OF HWY 14 TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 39 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 55 TRUCKS 4

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 13 0 STOP TIME 1430 DIRECTION OF TRAVEL N AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
96	1	0	1	0.7	0.0	0.7	1.22	0.0	1.14	100.00	100.00	100.00
94	1	0	1	0.7	0.0	0.7	1.22	0.0	1.14	98.78	100.00	98.86
92	0	0	0	0.3	0.0	0.3	0.61	0.0	0.57	97.56	100.00	97.71
90	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	96.95	100.00	97.14
88	0	0	0	0.7	0.0	0.7	1.22	0.0	1.14	96.95	100.00	97.14
86	2	0	2	0.7	0.0	0.7	1.22	0.0	1.14	95.73	100.00	96.00
84	0	0	0	0.7	0.0	0.7	1.22	0.0	1.14	94.51	100.00	94.86
82	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	93.29	100.00	93.71
80	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	93.29	100.00	93.71
78	0	0	0	0.7	0.0	0.7	1.22	0.0	1.14	93.29	100.00	93.71
76	2	0	2	1.7	0.0	1.7	3.05	0.0	2.86	92.07	100.00	92.57
74	3	0	3	2.3	0.0	2.3	4.27	0.0	4.00	89.02	100.00	89.71
72	2	0	2	3.0	0.0	3.0	5.49	0.0	5.14	84.76	100.00	85.71
70	4	0	4	4.0	0.7	4.7	7.32	18.18	8.00	79.27	100.00	80.57
68	6	2	8	4.7	1.0	5.7	6.54	27.27	9.71	71.95	81.82	72.57
66	4	1	5	5.0	1.0	6.0	9.15	27.27	10.29	63.41	54.55	62.86
64	5	0	5	4.0	0.3	4.3	7.32	9.09	7.43	54.27	27.27	55.57
62	3	0	3	5.0	0.0	5.0	9.15	0.0	8.57	46.95	18.18	48.14
60	5	0	5	5.0	0.0	5.0	9.15	0.0	8.57	37.80	18.18	39.57
58	5	0	5	5.3	0.0	5.3	9.76	0.0	9.14	28.66	18.18	31.00
56	4	0	4	4.3	0.0	4.3	7.93	0.0	7.43	18.90	18.18	21.86
54	4	0	4	2.7	0.0	2.7	4.88	0.0	4.57	10.98	18.18	14.43
52	0	0	0	2.0	0.0	2.0	3.66	0.0	3.43	6.10	18.18	6.86
50	2	0	2	0.7	0.0	0.7	1.22	0.0	1.14	2.44	18.18	3.43
48	0	0	0	0.7	0.3	1.0	1.22	9.09	1.71	1.22	18.18	2.29
46	0	1	1	0.0	0.3	0.3	0.0	9.09	0.57	-0.00	9.09	0.57

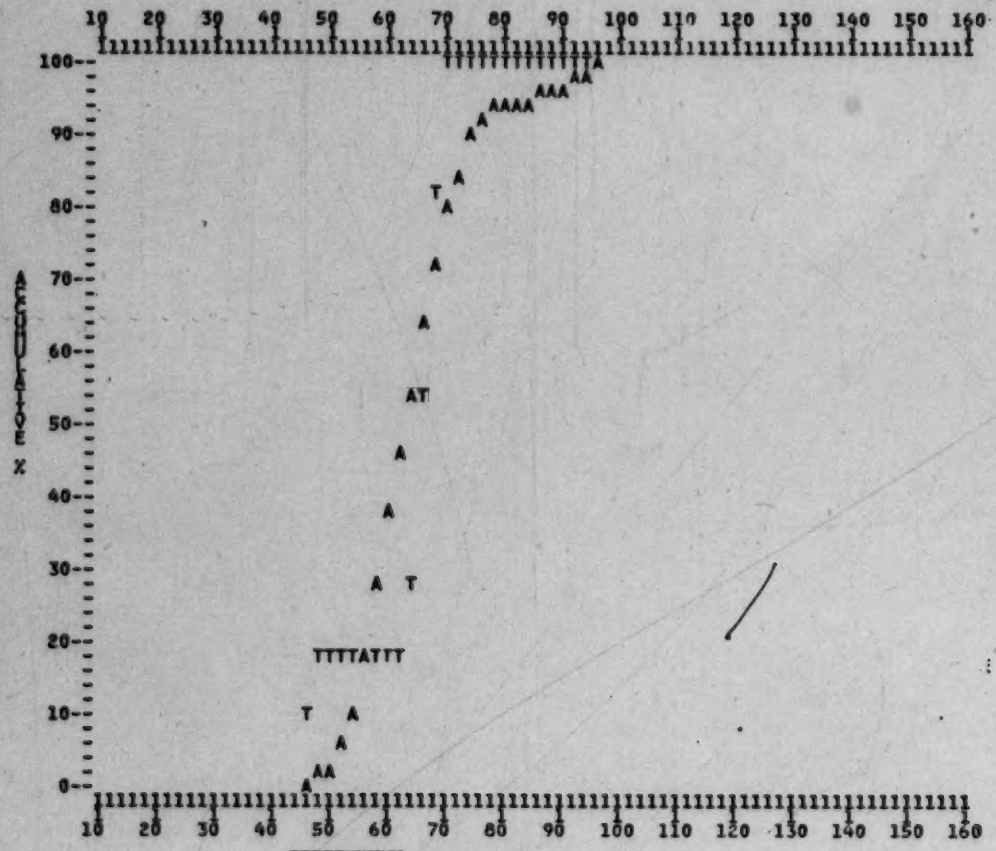
	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	72.1	62.8	55.0	65.0	2.5	9.5	1.8
TRUCKS	68.3	65.7	47.3	63.6	8.2	8.0	5.8
COMBINED	71.7	63.3	55.0	64.9	2.4	9.4	1.7

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

HIGHWAY 14 LOCATION NE RAMP .4KM NORTH OF HWY 14 TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 39 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 55 TRUCKS 4

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 13 0 STOP TIME 1430 DIRECTION OF TRAVEL N AADT



PLOT OF ACCUMULATIVE % VS. SPEED

A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSP ..TION
TRANSPORTATION SAFETY E..NCA
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION NE RAMP .3KM NORTH OF HWY 14 TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 36 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 56 TRUCKS 4

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 1020 STOP TIME 12 0 DIRECTION OF TRAVEL N AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
76	1	0	1	1.3	0.0	1.3	2.41	0.0	2.25	100.00	100.00	100.00
74	1	0	1	1.3	0.0	1.3	2.41	0.0	2.25	97.59	100.00	97.75
72	0	0	0	1.3	0.0	1.3	2.41	0.0	2.25	95.18	100.00	95.51
70	1	0	1	2.0	0.0	2.0	3.61	0.0	3.37	92.77	100.00	93.26
68	2	0	2	2.7	0.0	2.7	4.82	0.0	4.49	89.16	100.00	89.89
66	2	0	2	3.3	0.0	3.3	7.83	0.0	7.30	84.34	100.00	85.39
64	4	0	4	4.7	0.0	4.7	8.43	0.0	7.87	76.51	100.00	78.09
62	5	0	5	5.7	0.0	5.7	10.24	0.0	9.55	68.07	100.00	70.22
60	5	0	5	4.7	0.3	5.0	8.43	8.33	8.43	57.83	100.00	60.67
58	5	1	6	5.3	0.7	6.0	9.64	16.67	10.11	49.40	91.67	52.25
56	6	1	7	5.7	1.0	6.7	10.24	25.00	10.11	39.76	75.00	42.13
54	6	1	7	6.0	0.7	6.7	10.84	16.67	11.24	29.52	50.00	30.90
52	4	0	4	3.7	0.3	4.0	6.63	8.33	6.74	18.67	33.33	19.66
50	1	0	1	2.3	0.3	2.7	4.22	8.33	4.49	12.05	25.00	12.92
48	1	0	1	1.3	0.3	1.7	2.41	8.33	2.81	7.83	16.67	8.43
46	1	0	1	1.3	0.3	1.7	2.41	8.33	2.81	5.42	8.34	5.62
44	1	0	1	0.7	0.0	0.7	1.20	0.0	1.12	3.01	0.00	2.81
42	0	0	0	0.7	0.0	0.7	1.20	0.0	1.12	1.81	0.00	1.69
40	1	0	1	0.3	0.0	0.3	0.60	0.0	0.56	0.60	0.00	0.56

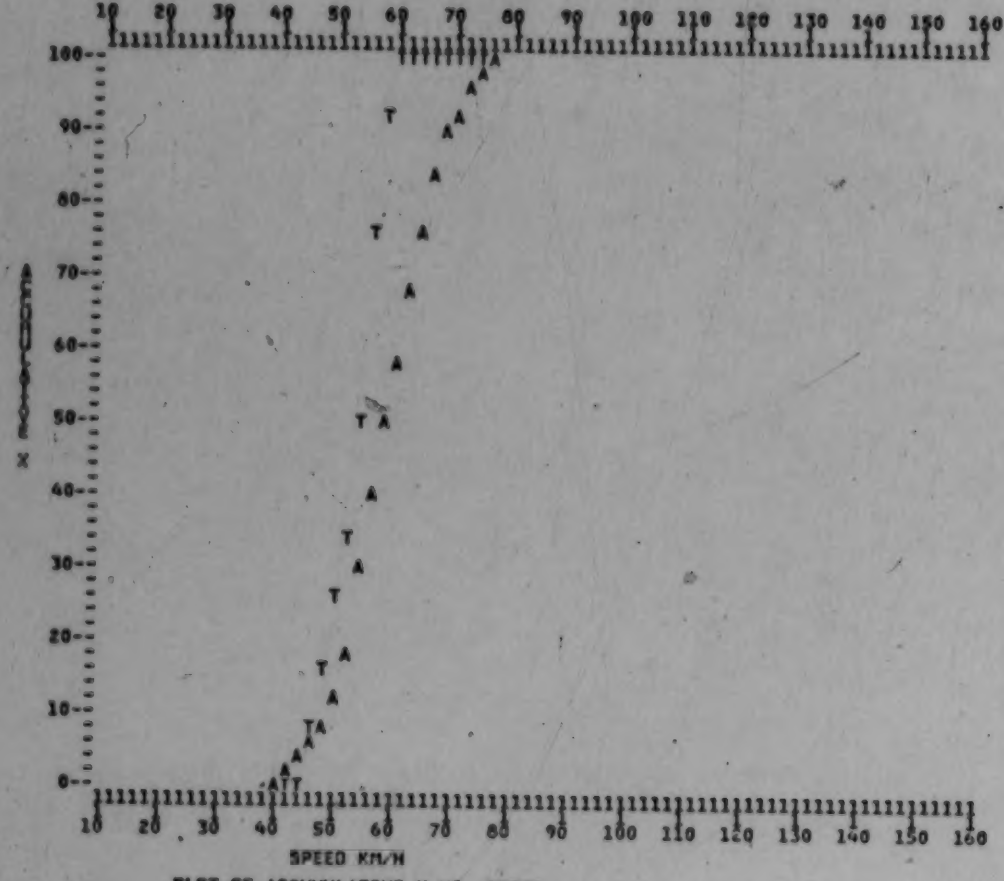
	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	66.3	58.1	50.9	59.4	2.0	7.6	1.4
TRUCKS	57.2	54.0	47.6	54.0	4.0	4.1	2.8
COMBINED	65.9	57.6	50.6	59.0	1.9	7.5	1.4

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

HIGHWAY 14 LOCATION NE RAMP .3KM NORTH OF HWY 14 TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 36 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 56 TRUCKS 4

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 1020 STOP TIME 12 0 DIRECTION OF TRAVEL N AADT



PLOT OF ACCUMULATIVE % VS. SPEED

A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSP. TION
TRANSPORTATION SAFETY B. CH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION NE RAMP .4KM NORTH OF HWY 14 TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 39 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 55 TRUCKS 4

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 13 0 STOP TIME 1430 DIRECTION OF TRAVEL N AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
96	1	0	1	0.7	0.0	0.7	1.22	0.0	1.14	100.00	100.00	100.00
94	1	0	1	0.7	0.0	0.7	1.22	0.0	1.14	98.78	100.00	98.86
92	0	0	0	0.3	0.0	0.3	0.61	0.0	0.57	97.56	100.00	97.71
90	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	96.95	100.00	97.14
88	0	0	0	0.2	0.0	0.2	1.22	0.0	1.14	96.95	100.00	97.14
86	0	0	0	0.7	0.0	0.7	1.22	0.0	1.14	95.73	100.00	96.00
84	0	0	0	0.7	0.0	0.7	1.22	0.0	1.14	94.51	100.00	94.86
82	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	93.29	100.00	93.71
80	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	93.29	100.00	93.71
78	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	93.29	100.00	93.71
76	1	0	1	0.7	0.0	0.7	1.22	0.0	1.14	93.29	100.00	93.71
74	1	0	1	1.3	0.0	1.3	1.22	0.0	1.14	92.07	100.00	92.57
72	2	0	2	2.0	0.0	2.0	2.44	0.0	2.29	90.85	100.00	91.43
70	3	0	3	2.7	0.0	2.7	3.66	0.0	3.43	88.41	100.00	89.14
68	4	1	5	3.3	0.7	4.0	4.88	18.18	6.86	84.76	100.00	85.71
66	4	1	5	3.7	0.7	4.7	4.88	18.18	6.86	79.27	100.00	80.57
64	5	1	6	4.0	0.7	5.7	6.10	18.18	8.00	74.39	100.00	74.57
62	4	1	5	4.0	1.0	5.0	4.88	18.18	6.86	68.29	81.82	68.57
60	5	1	6	4.0	1.3	5.3	6.10	18.18	8.00	63.41	63.64	61.71
58	3	0	3	3.3	1.3	4.3	3.66	0.0	3.43	57.32	45.45	53.71
56	3	0	3	3.0	1.3	4.3	3.66	0.0	3.43	53.66	45.45	50.29
54	3	0	3	3.0	1.3	4.3	3.66	0.0	3.43	50.00	45.45	46.86
52	3	0	3	3.0	1.3	4.3	3.66	0.0	3.43	46.34	45.45	43.43
50	4	0	4	3.3	1.3	4.3	4.88	0.0	4.57	42.68	45.45	40.00
48	3	0	3	3.3	1.3	4.3	3.66	0.0	3.43	37.80	45.45	35.43
46	4	0	4	3.3	1.3	5.3	4.88	0.0	4.57	34.15	45.45	31.86
44	4	0	4	3.3	1.3	5.3	4.88	0.0	4.57	29.27	45.45	27.29
42	4	0	4	3.3	1.3	5.3	4.88	0.0	4.57	24.39	45.45	22.71
40	2	0	2	2.7	0.0	2.7	2.44	0.0	2.29	19.51	45.45	18.29
38	3	0	3	2.0	0.0	2.0	3.66	0.0	3.43	17.07	45.45	16.00
36	1	0	1	0.7	0.0	0.7	1.22	0.0	1.14	13.41	45.45	12.57
34	1	0	1	0.7	0.0	0.7	1.22	0.0	1.14	12.20	45.45	11.43
32	1	0	1	0.7	0.0	0.7	1.22	0.0	1.14	10.98	45.45	10.29
30	2	0	2	1.0	0.0	1.0	2.44	0.0	2.29	9.76	45.45	9.14
28	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
26	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
24	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
22	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
20	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
18	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
16	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
14	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
12	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
10	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
8	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
6	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
4	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
2	0	0	0	0.7	0.0	0.7	0.0	0.0	0.0	7.32	45.45	6.86
0	0	1	1	0.7	0.3	1.0	0.0	9.09	1.71	7.32	45.45	6.86
46	0	1	1	0.6	0.3	0.3	0.0	9.09	0.57	-0.00	9.09	0.57

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	72.1	62.8	55.0	65.0	2.5	9.5	1.8
TRUCKS	68.3	65.7	47.3	63.6	8.2	8.0	5.8
COMBINED	71.7	63.3	55.0	64.9	2.4	9.4	1.7

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

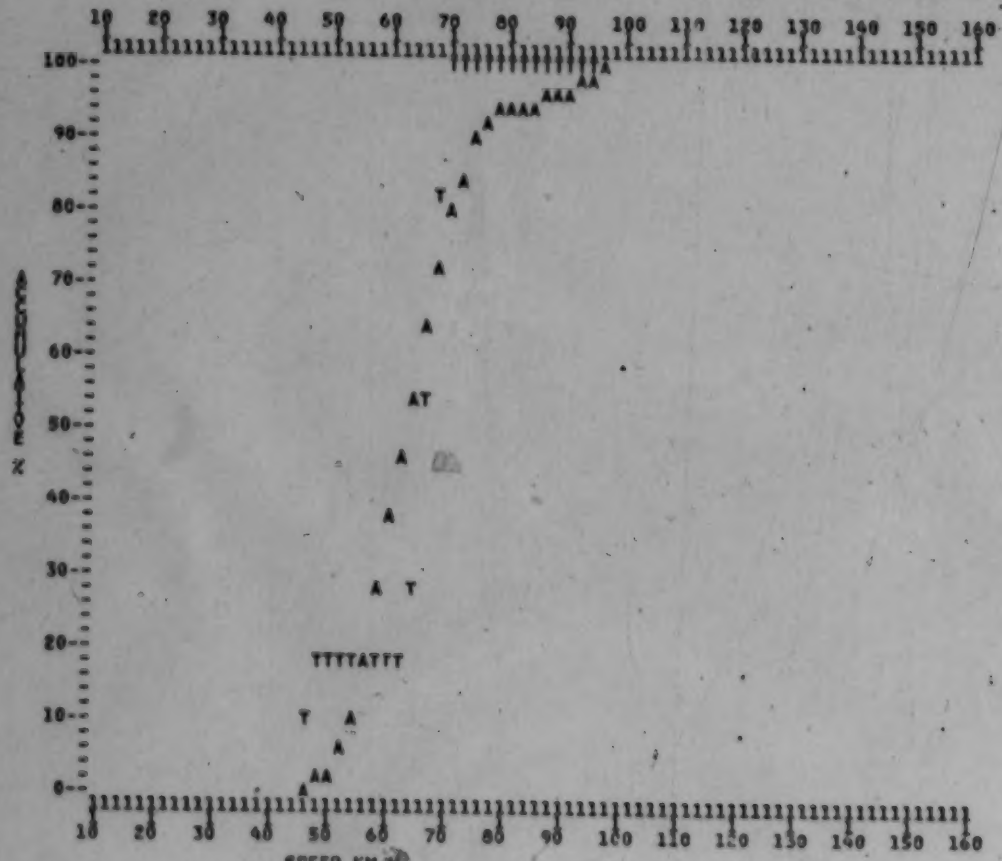
ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 26/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION NE RAMP .4KM NORTH OF HWY 14 TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 39 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 55 TRUCKS 4

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 13 0 STOP TIME 1430 DIRECTION OF TRAVEL N AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 27/80
STUDY NUMBER 1408

HIGHWAY 14 LOCATION NE RAMP .3KM NORTH OF HWY 14 TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 36 VEHICLES PER HOUR SPEED LIMIT AUTOS 80 KM/H TRUCKS 80 KM/H SAMPLE SIZE AUTOS 56 TRUCKS 4

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 1020 STOP TIME 12 0 DIRECTION OF TRAVEL N AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
76	1	0	1	1.3	0.0	1.3	2.41	0.0	2.25	100.00	100.00	100.00
74	1	0	1	1.3	0.0	1.3	2.41	0.0	2.25	97.59	100.00	97.75
72	0	0	0	1.3	0.0	1.3	2.41	0.0	2.25	95.18	100.00	95.51
70	1	0	1	1.3	0.0	1.3	2.41	0.0	2.25	92.77	100.00	93.26
68	2	0	2	1.3	0.0	1.3	4.82	0.0	4.49	89.16	100.00	90.99
66	2	0	2	1.3	0.0	1.3	4.82	0.0	4.49	84.34	100.00	85.39
64	3	0	3	1.3	0.0	1.3	7.83	0.0	7.30	79.52	100.00	80.90
62	3	0	3	1.3	0.0	1.3	7.83	0.0	7.30	71.69	100.00	73.60
60	3	0	3	1.3	0.0	1.3	7.83	0.0	7.30	63.86	100.00	66.29
58	3	1	4	1.3	0.3	1.7	10.24	0.0	9.55	56.02	100.00	58.99
56	2	1	3	1.3	0.3	1.7	8.43	8.33	8.43	45.78	100.00	49.44
54	3	1	4	1.3	0.3	1.7	9.64	16.67	10.11	37.35	91.67	41.01
52	3	1	4	1.3	0.3	1.7	10.24	25.00	11.24	27.71	75.00	30.90
50	4	0	4	1.3	0.3	1.7	10.84	16.67	11.24	17.47	50.00	19.66
48	2	0	2	1.3	0.3	1.7	6.63	8.33	6.74	6.63	33.33	8.43
46	1	0	1	1.3	0.3	1.7	4.22	8.33	4.49	1.81	25.00	1.69
44	1	0	1	1.3	0.3	1.7	2.41	8.33	2.81	1.81	16.67	1.69
42	0	0	0	0.7	0.0	0.7	1.20	0.0	1.12	1.81	8.34	1.69
40	1	0	1	0.3	0.0	0.3	0.60	0.0	0.56	0.60	0.00	0.56

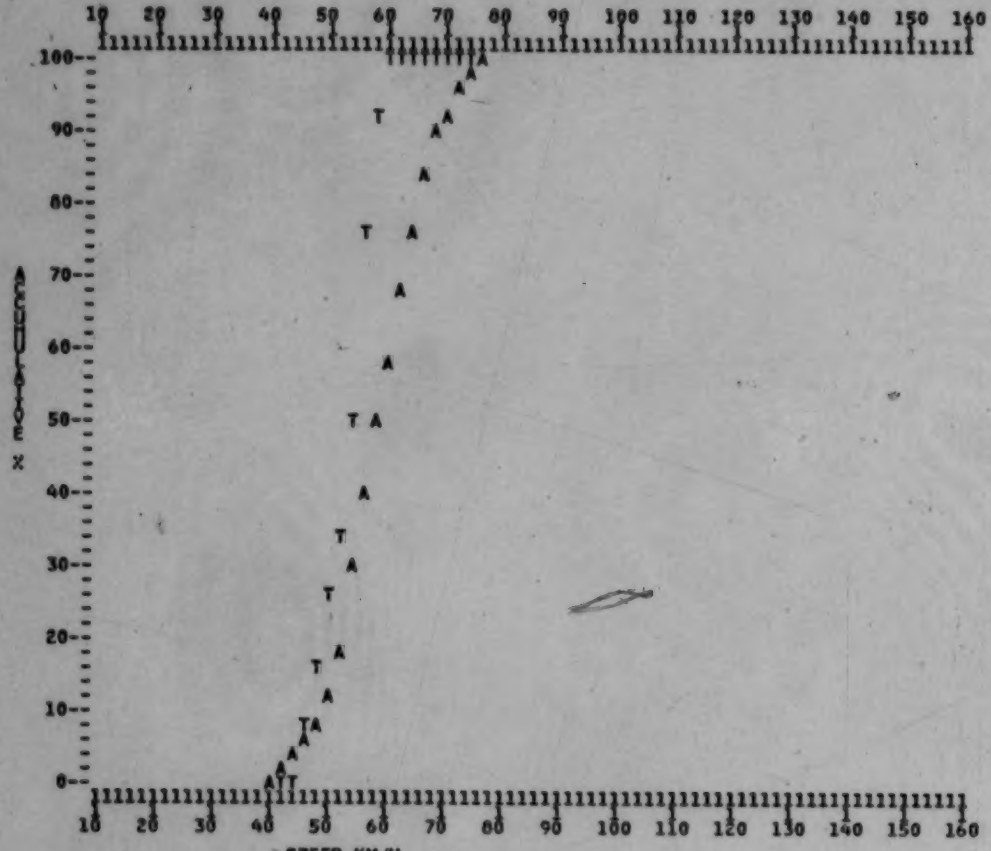
	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	66.3	58.1	50.9	59.4	2.0	7.6	1.4
TRUCKS	57.2	54.0	47.6	54.0	4.0	4.1	2.8
COMBINED	65.9	57.6	50.6	59.0	1.9	7.5	1.4

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

HIGHWAY 14 LOCATION NE RAMP .3KM NORTH OF HWY 14 TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 36 VEHICLES PER HOUR SPEED LIMIT AUTOS 50 KM/H TRUCKS 50 KM/H SAMPLE SIZE AUTOS 56 TRUCKS 4

DATE 7 5 80 LIGHT CONDITIONS-- DAY START TIME 1020 STOP TIME 12 0 DIRECTION OF TRAVEL N AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSP[illegible]TION
TRANSPORTATION SAFETY B[illegible]CH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION .4 KM N HWY 14 NE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 36 VEHICLES PER HOUR SPEED LIMIT AUTOS 70 KM/H TRUCKS 70 KM/H SAMPLE SIZE AUTOS 92 TRUCKS 8

DATE 20 5 80 LIGHT CONDITIONS-- DAY START TIME 1315 STOP TIME 16 0 DIRECTION OF TRAVEL N AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
80	1	0	1	0.3	0.0	0.3	0.36	0.0	0.34	100.00	100.00	100.00
78	0	0	0	0.7	0.0	0.7	0.73	0.0	0.67	99.64	100.00	99.66
76	1	0	1	1.0	0.0	1.0	1.09	0.0	1.01	98.91	100.00	98.99
74	2	0	2	1.7	0.0	1.7	1.82	0.0	1.68	97.82	100.00	97.99
72	2	0	2	2.0	0.0	2.0	2.25	0.0	2.02	96.00	100.00	96.31
70	5	0	5	2.0	0.0	2.0	5.45	0.0	5.03	92.73	100.00	93.29
68	6	0	6	2.7	0.0	2.7	8.36	0.0	7.72	87.27	100.00	88.26
66	10	0	10	4.3	0.3	4.7	9.09	4.35	8.72	78.91	100.00	80.54
64	7	0	7	6.3	0.3	6.7	9.09	4.35	8.72	69.82	95.65	71.81
62	8	0	8	8.3	0.3	8.7	9.09	4.35	8.72	60.73	91.30	63.09
60	10	1	11	9.3	0.3	9.7	10.18	4.35	9.73	51.64	82.61	54.03
58	10	0	10	9.3	0.7	10.0	10.18	8.70	10.07	41.45	78.26	44.30
56	9	1	10	9.3	1.3	9.7	9.09	17.39	9.73	31.27	69.57	34.23
54	7	1	8	8.7	1.7	8.3	7.27	21.74	8.39	22.18	52.17	24.50
52	5	1	6	6.7	1.3	6.0	5.09	17.39	6.04	14.91	30.44	16.11
50	3	0	3	5.3	0.3	5.7	3.64	4.35	3.69	9.82	13.04	10.07
48	2	0	2	3.0	0.0	3.0	2.18	0.0	2.01	6.18	8.70	6.38
46	1	0	1	2.0	0.0	2.0	1.82	0.0	1.68	4.00	8.70	4.36
44	1	0	1	1.7	0.0	1.7	1.09	0.0	1.01	2.18	8.70	2.68
42	1	0	1	1.0	0.0	1.0	0.73	4.35	1.01	1.09	8.70	1.68
40	0	1	1	0.3	0.3	0.7	0.36	4.35	0.67	0.36	4.35	0.67

	PERCENTILE 85	PERCENTILE 50	PERCENTILE 15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	67.5	59.7	52.0	60.7	1.5	7.4	1.1
TRUCKS	60.5	53.8	50.2	55.0	4.2	5.9	3.0
COMBINED	67.2	59.2	51.6	60.2	1.5	7.5	1.0

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

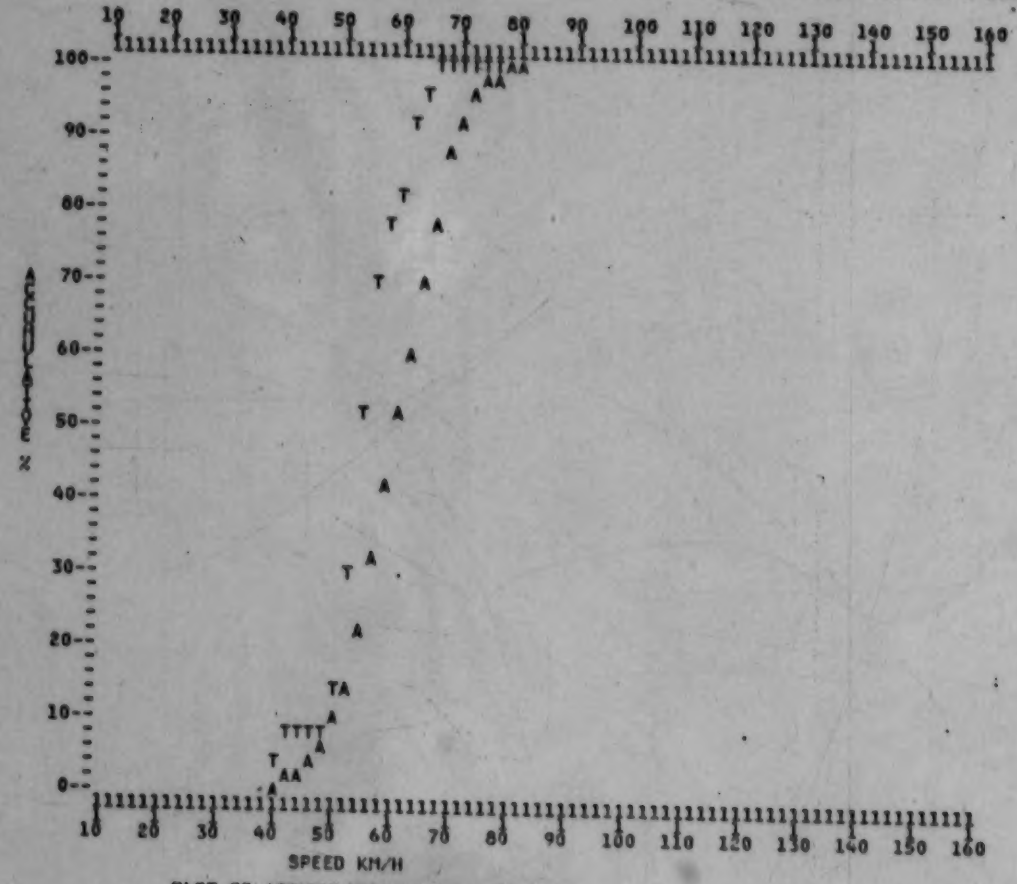
ALBERTA DEPARTMENT OF TRANSP ATION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1410

HIGHWAY 14 LOCATION .4 KM N HWY 14 NE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 36 VEHICLES PER HOUR SPEED LIMIT AUTOS 70 KM/H SAMPLE SIZE AUTOS 92
TRUCKS 70 KM/H TRUCKS 8

DATE 20 5 80 LIGHT CONDITIONS-- DAY START TIME 1315 STOP TIME 16 0 DIRECTION OF TRAVEL N AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

ALBERTA DEPARTMENT OF TRANSPO ION
TRANSPORTATION SAFETY BRANCH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 28/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION .3 KM N HWY 14 NE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 36 VEHICLES PER HOUR SPEED LIMIT AUTOS 70 KM/H SAMPLE SIZE AUTOS 89
TRUCKS 70 KM/H TRUCKS 11

DATE 20 5 80 LIGHT CONDITIONS-- DAY START TIME 1315 STOP TIME 16 0 DIRECTION OF TRAVEL N AADT

SPEED CLASS KM/H	NO OF VEHICLES IN CLASS			SMOOTHED FREQUENCY			PERCENT OF VEHICLES			CUMULATIVE PERCENT FREQUENCY		
	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED	AUTOS	TRUCKS	COMBINED
80	1	0	1	1.0	0.3	1.3	1.13	3.03	1.34	100.00	100.00	100.00
78	2	0	2	1.7	0.3	2.0	1.69	3.03	1.81	98.87	96.97	98.66
76	2	0	2	1.7	0.3	2.0	1.69	3.03	1.81	97.18	93.94	96.84
74	2	0	2	2.0	0.0	2.0	2.26	0.0	2.01	95.49	90.91	95.03
72	3	0	3	2.3	0.0	2.3	3.38	0.0	3.02	93.23	90.91	93.02
70	3	0	3	2.3	0.0	2.3	3.64	0.0	3.35	89.85	90.91	90.00
68	3	1	4	3.0	0.3	3.3	3.40	3.03	3.36	86.47	90.91	86.91
66	10	0	10	5.3	0.3	5.7	9.04	3.03	8.70	83.11	87.88	83.55
64	6	2	8	6.3	1.0	7.3	9.77	9.09	9.73	74.07	84.85	74.83
62	6	2	8	6.0	0.7	6.7	9.76	12.12	10.07	64.30	75.76	65.10
60	6	1	7	7.3	1.3	8.7	9.30	9.09	9.40	54.53	63.64	55.37
58	5	2	7	7.0	1.0	8.0	7.75	9.09	8.05	45.23	54.55	45.97
56	5	0	5	6.0	0.3	6.3	6.79	3.03	6.38	37.48	45.45	37.92
54	5	0	5	5.3	0.3	5.7	6.04	3.03	5.70	30.69	42.42	31.54
52	6	0	6	6.0	0.3	6.3	6.79	3.03	6.38	24.65	39.39	25.84
50	6	1	7	6.3	0.7	7.0	6.42	9.09	6.71	17.86	36.36	19.46
48	4	1	5	5.7	1.0	6.7	4.15	6.06	4.36	11.44	27.27	12.75
46	1	0	1	3.0	0.7	3.7	2.26	3.03	2.35	7.29	21.21	8.39
44	1	0	1	2.0	0.3	2.3	1.13	0.0	1.01	5.03	18.18	6.04
42	1	0	1	1.0	0.0	1.0	1.51	0.0	1.34	3.90	15.15	5.03
40	1	0	1	1.7	0.0	1.7	1.69	0.0	1.68	2.39	15.15	3.69
38	1	0	1	1.7	0.0	1.7	1.69	0.0	1.68	0.70	15.15	2.01
36	0	1	1	1.0	0.3	1.3	1.13	3.03	1.34	0.00	15.15	0.34
34	0	0	0	0.7	0.3	1.0	0.75	3.03	1.01	0.00	12.12	0.00
32	1	0	1	0.3	0.3	0.7	0.38	3.03	0.67	0.38	3.03	0.67

	PERCENTILE 85	50	15	MEAN SPEED	95% CONFIDENCE LIMIT ON MEAN	STANDARD DEVIATION	95% CONFIDENCE LIMIT ON STD DEV
AUTOS	67.4	58.4	48.0	58.6	2.1	9.9	1.5
TRUCKS	66.1	58.3	46.9	57.8	6.6	11.2	4.7
COMBINED	67.3	58.4	47.8	58.6	2.0	10.0	1.4

RESULTS OF THIS STUDY HAVE NOT BEEN ADDED TO THE HISTORY TAPE FILE.

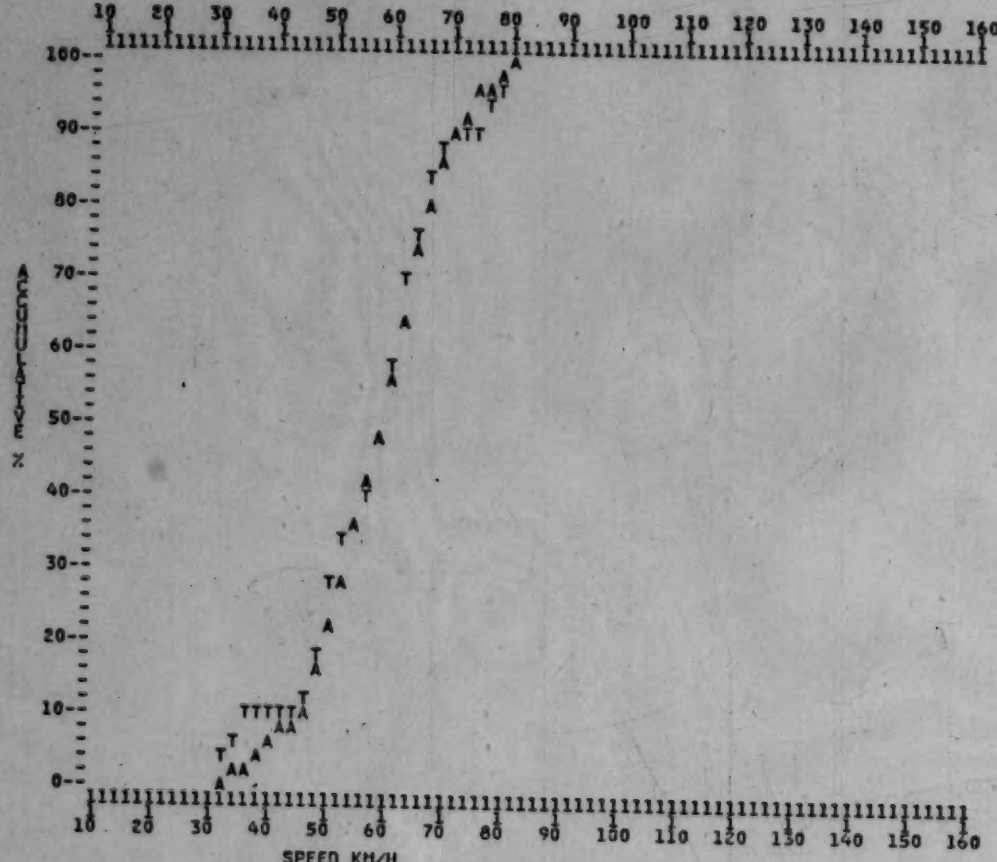
ALBERTA DEPARTMENT OF TRANSP TION
TRANSPORTATION SAFETY B CH
SPEED STUDY ANALYSIS

ANALYSIS DATE MAY 20/80
STUDY NUMBER 1400

HIGHWAY 14 LOCATION .3 KM N HWY 14 NE RAMP TYPE OF HIGHWAY FOUR LANE DIVIDED, LIMITED ACCESS

TRAFFIC DENSITY 36 VEHICLES PER HOUR SPEED LIMIT AUTOS 70 KM/H SAMPLE SIZE AUTOS 69
TRUCKS 70 KM/H TRUCKS 11

DATE 20 5 80 LIGHT CONDITIONS-- DAY START TIME 1315 STOP TIME 16 0 DIRECTION OF TRAVEL N AADT



PLOT OF ACCUMULATIVE % VS. SPEED
A = AUTOS T = TRUCKS

APPENDIX 7

SPEED STUDY HISTORIES

HWY NO.002 STUDY NO.1000 LOCATION:1 MILE SOUTH OF NISKU N BOUND DAY STUDY HWY TYPE:4 LANE DIVIDED-EXPRESSWAY

			CARS ONLY						TRUCKS ONLY						COMBINED TOTALS				
YEAR	AADT	NO OF STUDIES	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	TOTAL SAMPLE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED
1977	20,000	5	100	2,210	106	097	087	098	90	378	102	094	085	094	2,588	106	097	087	097
1976	20,235	2	65M	540	110	101	091	102	55M	58	102	095	081	095	598	110	099	090	101
1975	20,085	2	65M	698	105	096	084	096	55M	103	099	090	081	090	801	105	095	084	096
1974	14,290	3	65M	922	108	099	087	100	55M	125	100	090	079	091	1,047	107	097	087	099
1973	13,155	1	65M	243	108	098	087	100	55M	33	097	087	079	089	276	108	097	085	098
1972	13,510	2	65M	542	107	097	087	099	55M	64	099	092	081	093	606	107	097	087	098
1971	12,020	1	65M	149	105	093	084	095	55M	12	093	089	082	089	161	103	093	084	095
1970	11,400	1	65M	410	100	090	079	090	55M	86	090	081	069	082	496	098	089	077	089
1969	10,100	2	65M	360	102	091	079	091	55M	55	094	085	072	084	415	101	090	077	091
1968	10,000	2	65M	293	099	088	076	089	55M	44	088	082	075	084	337	098	086	076	088
1967	10,100	2	65M	595	103	091	080	092	50M	104	090	081	070	082	699	101	089	078	091
1966	9,500	2	65M	222	106	095	083	096	50M	33	097	085	078	087	255	105	094	081	095

HWY NO.002 STUDY NO.1001 LOCATION: 2 KM SOUTH OF NISKU S BOUND DAY STUDY HWY TYPE:2 LANE PAVED - HIGH STD.

			CARS ONLY						TRUCKS ONLY						COMBINED TOTALS				
YEAR	AADT	NO OF STUDIES	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	TOTAL SAMPLE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED
1978	22,280	1	100	316	109	099	091	101	90	56	098	091	077	090	372	108	098	088	099
1977	20,000	5	100	2,389	108	099	089	100	90	369	100	093	083	093	2,758	107	098	087	098
1976	20,235	2	65M	568	111	102	092	103	55M	72	101	094	085	095	640	110	101	091	102
1975	20,085	3	65M	1,111	111	100	089	102	55M	163	096	088	078	089	1,274	110	099	086	100
1974	14,290	2	65M	609	110	101	093	103	55M	71	105	093	082	094	680	109	101	091	102
1973	13,155	1	65M	253	111	101	090	103	55M	34	101	092	082	093	287	109	100	089	101
1972	13,510	2	65M	562	108	100	090	101	55M	40	099	088	081	090	602	108	099	088	100
1971	12,020	1	65M	177	108	098	089	100	55M	29	097	090	084	092	206	108	097	087	098

HWY NO.016 STUDY NO.4051 LOCATION: 4 KM WEST OF WINTERBURN W BOUND DAY STUDY HWY TYPE:4 LANE DIVIDED-EXPRESSWAY

			CARS ONLY						TRUCKS ONLY						COMBINED TOTALS				
YEAR	AADT	NO OF STUDIES	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	TOTAL SAMPLE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED
1978	26,700	2	100	601	103	095	085	095	90	126	097	090	081	091	727	103	094	084	095
1977	23,700	1	65M	372	112	099	087	100	55M	76	096	086	079	089	448	110	098	086	098
1975	17,935	1	65M	302	105	095	084	097	55M	62	097	085	077	089	364	103	093	082	095
1974	15,515	1	65M	284	109	100	089	100	55M	50	095	087	076	087	334	108	098	085	098
1973	15,515	1	65M	240	108	100	090	101	55M	57	098	090	084	092	297	108	098	087	100
1972	14,610	2	65M	349	106	097	087	099	55M	54	097	087	077	089	403	106	096	084	098
1971	11,905	1	65M	225	101	092	081	093	55M	54	092	084	077	087	279	100	090	081	092
1970	9,260	1	65M	316	108	097	087	098	55M	48	097	089	079	090	364	106	095	085	098
1969	8,600	2	65M	319	104	092	082	094	55M	79	092	085	075	086	398	102	092	079	094
1968	8,500	2	65M	270	104	095	086	096	55M	68	092	084	075	085	338	102	093	081	094
1967	7,100	2	65M	319	099	089	077	089	50M	48	084	078	067	078	367	097	087	075	088
1966	8,500	2	65M	230	098	088	076	090	50M	34	089	080	072	081	264	098	087	075	088

HWY NO.016 STUDY NO.4052 LOCATION: 4 KM WEST OF WINTERBURN E BOUND NIT STUDY HWY TYPE:4 LANE DIVIDED-EXPRESSWAY

			CARS ONLY						TRUCKS ONLY						COMBINED TOTALS				
YEAR	AADT	NO OF STUDIES	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	TOTAL SAMPLE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED
1978	26,700	1	90	158	109	098	085	098	80	21	100	093	085	093	179	107	097	085	098
1977	23,700	1	55M	83	113	099	086	101	55M	10	106	097	090	099	93	112	099	087	100
1972	15,745	1	55M	161	098	090	081	092	55M	15	097	090	084	092	176	098	090	081	092
1971	13,420	1	55M	148	101	089	081	092	55M	6	093	084	079	087	154	101	089	081	092
1970	9,260	1	55M	92	105	093	084	095	55M	33	093	087	081	089	125	101	092	082	093
1969	8,600	1	55M	95	100	087	081	090	55M	14	089	082	074	082	109	098	087	079	090
1968	8,500	1	55M	91	095	087	079	089	55M	17	092	085	079	087	108	095	087	079	089
1967	7,900	1	55M	102	090	081	074	082	50M	13	082	060	055	068	115	089	081	068	081

SPEED STUDY HISTORY ANALYSIS

HWY NO.014 STUDY NO.3250 LOCATION:2.0 M.W. OF SALISBURY INTER. E BOUND DAY STUDY HWY TYPE:4 LANE DIVIDED-FREEWAY

			CARS ONLY						TRUCKS ONLY						COMBINED TOTALS				
YEAR	AADT	NO OF STUDIES	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	TOTAL SAMPLE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED
1974	25,945	2	70M	634	111	100	091	102	60M	88	097	088	075	089	722	110	100	087	100
1972	21,000	2	70M	692	107	096	083	097	60M	93	094	085	070	084	785	105	095	081	096
1971	16,000	2	70M	374	106	093	081	095	60M	52	089	078	069	080	426	105	092	077	093

HWY NO.014 STUDY NO.3251 LOCATION:2.0 M.W. OF SALISBURY INTER. W BOUND DAY STUDY HWY TYPE:4 LANE DIVIDED-FREEWAY

			CARS ONLY						TRUCKS ONLY						COMBINED TOTALS				
YEAR	AADT	NO OF STUDIES	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	TOTAL SAMPLE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED
1974	25,945	2	70M	700	112	101	091	104	60M	68	096	088	080	090	768	112	100	090	101
1972	21,000	2	70M	710	107	095	083	096	60M	76	095	085	074	086	786	106	094	083	095
1971	16,000	2	70M	419	109	098	082	098	60M	80	096	085	074	087	499	109	095	081	097

HWY NO.014 STUDY NO.3350 LOCATION:5 KM EAST OF JCT 14 & 21 E BOUND DAY STUDY HWY TYPE:4 LANE DIVIDED-EXPRESSWAY

			CARS ONLY						TRUCKS ONLY						COMBINED TOTALS				
YEAR	AADT	NO OF STUDIES	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	TOTAL SAMPLE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED
1978	3,890	2	90	180	107	099	086	099	80	20	102	091	086	094	200	106	098	086	098
1975	2,750	1	60M	131	097	085	069	085	50M	28	090	077	064	079	159	097	084	068	084
1972	2,360	2	60M	334	099	087	076	089	50M	56	083	074	064	075	390	097	086	073	087
1971	1,980	2	60M	202	096	085	075	087	50M	27	081	076	070	077	229	096	084	074	087
1970	1,900	2	60M	210	102	093	083	093	50M	25	095	081	071	084	235	102	093	081	093
1969	2,000	2	60M	202	097	084	073	086	50M	16	085	079	072	080	218	096	083	072	085

HWY NO.014 STUDY NO.3351 LOCATION: 5 KM EAST OF JCT 14 & 21 W BOUND DAY STUDY HWY TYPE:4 LANE DIVIDED-EXPRESSWAY

			CARS ONLY						TRUCKS ONLY						COMBINED TOTALS				
YEAR	AADT	NO OF STUDIES	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	SPEED LIMIT	SAMPLE SIZE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED	TOTAL SAMPLE	85 %ILE	50 %ILE	15 %ILE	MEAN SPEED
1978	3,890	2	90	151	102	094	083	093	80	7	097	085	081	089	158	101	094	082	093
1975	2,750	1	60M	182	098	084	071	085	50M	19	090	077	071	081	201	097	084	071	085
1972	2,360	2	60M	386	099	085	071	087	50M	28	091	081	072	083	414	099	085	071	086
1971	1,980	2	60M	228	099	086	072	087	50M	13	085	079	072	080	241	099	085	073	087
1970	1,900	2	60M	202	101	092	080	092	50M	34	088	081	072	082	236	100	090	079	091
1969	2,000	2	60M	211	094	082	068	083	50M	27	085	078	067	077	238	094	081	068	083